

## CURRICULUM VITAE

Niels Wijffels was born on December 1<sup>st</sup>, 1974 in a small town in Kenya called Tabaka, where his father was posted as a general doctor in a small hospital. After one and a half year his family decided to return to the Netherlands. He spend his early youth in Hilvarenbeek and moved to Oosterhout when he was eight years old. Here he attended secondary school at the St. Oelberts gymnasium and graduated in 1993. That same year he started Medical School at the Erasmus University Rotterdam. In 2000, he obtained his medical degree from the Erasmus University. After working for a short period of time as a house officer on the surgery ward in the Clara Hospital he was accepted for a general surgery residency which he started in 2002. This residency was done partly at the Medical Centre Rijnmond Zuid (MCRZ, now referred to as Maasstad Hospital) under supervision of dr. J.F. Lange/ dr. E. van der Harst. The other part was done at the Erasmus Medical Centre under supervision of prof. dr. J.N.M. IJermans. During his residency he sub specialised in laparoscopic gastro-enterologic surgery. In 2008 he graduated as a general surgeon and moved to Oxford, UK to follow a pelvic floor fellowship at the department of colorectal surgery at the John Radcliffe Hospital. During this year most of the research was done which formed the foundation of this thesis. In 2009 he started to work as a consultant in colorectal surgery at Zuwe Hofpoort Hospital in Woerden. In 2004 Niels has fallen in love with Klaar Vaandrager and they are now both proud parents of Eline(2007), Stijn(2009) and Teun(2011).



RECTAL PROLAPSE ENLIGHTENMENT OF THE OBSCURE

NIELS WIJFFELS

# RECTAL PROLAPSE

## ENLIGHTENMENT OF THE OBSCURE



NIELS WIJFFELS

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# **RECTAL PROLAPSE**

**Enlightenment of the obscure**

Niels Wijffels



# RECTAL PROLAPSE

## Enlightenment of the obscure

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aan de Universiteit van Amsterdam  
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# Chapter **1**

## **General introduction and outline of this thesis**



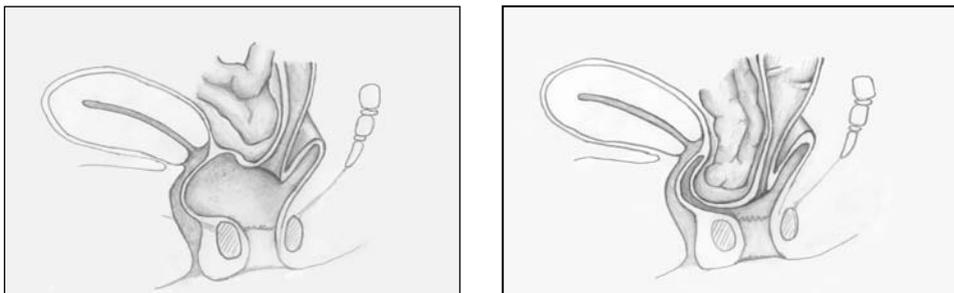
# Introduction

The terminology *rectal prolapse* is often used to refer to external rectal prolapse (ERP). ERP is a full thickness protrusion of the rectal wall through the anus. It can be easily diagnosed by physical examination when typically a circular folding of the mucosa is seen. It has been postulated that ERP is preceded by internal rectal prolapse (IRP)<sup>1,2,3</sup>. IRP, also referred to as rectal intussusception or occult rectal prolapse, is defined as a funnel-shaped infolding of the rectal wall that occurs during the act of defaecation. IRP is thought to cause functional symptoms such as obstructed defaecation and fecal incontinence<sup>13</sup>. The concept of IRP preceding ERP has been a longstanding subject for debate. Observational studies showed that progression from IRP to ERP was only rarely observed at long-term follow-up<sup>4,5</sup>. In asymptomatic volunteer-studies<sup>6,7,8</sup>, IRP has been noted to be a common cine-defaecographic finding (in up to 50% of volunteers<sup>9</sup>), thus clouding its clinical significance. And finally several publications have casted doubt upon the wisdom of a surgical solution<sup>10-12</sup>. Hence chasing the medical condition IRP and secondly its surgical treatment have suffered a bad reputation at the end of the last century<sup>11, 14,15</sup>.

However recently renewed interest in surgery for IRP has been gained. Partially this is due to the development of new surgical techniques such as transanal rectal resection, such as the STARR procedure<sup>16-21</sup> and a nerve-sparing technique anterior rectopexy with better functional outcome in patients treated for ERP and later, as a spin-off, treated for IRP<sup>22-24</sup>. Vice versa with the gained interest in IRP more research is done and published on physiologic aspects and symptomatology<sup>25-29</sup>. Much of the pathophysiology has not been clarified yet and more research is needed. Research on IRP is rather complex though, because of the interference of other functional pathologies such as slow transit constipation, anismus, lesions of the anal sphincter and even altered psychological behavior. Often a debate arises on cause and effect. *Does slow transit constipation cause IRP due to excessive straining? Or is the slow transit constipation objectified with a transit study secondary to an outlet obstruction such as IRP?* The same is true for found altered physiology in patients with IRP. *Are sensory abnormalities in pelvic floor dysfunction a cause of obstructed defaecation and IRP the effect of sub sequential straining? Or is IRP by itself causing sensory abnormalities because the prolapsing pelvic floor strains the pudendal nerve which is believed to cause pudendal nerve neuropathy (and sensory abnormality as a consequence)?* Cause and effect can often be turned around in this field of functional research. More fundamental research is needed to break this impasse.

The prolapsing pelvic floor has classically been divided into three different compartments; the anterior, middle and posterior compartment. In the prolapsed anterior compartment a cystocele can be detected, in the middle a vaginal and uterine prolapse and in the posterior a rectocele, enterocele and an IRP (or rectal intussusception). A combination of all three simultaneously prolapsing compartments is often seen<sup>32</sup>, displaying different variations of the same pathology. Dividing the three different compartments has partially been artificial and a logical consequence of medical (sub)specialisation. This same phenomenon is true for the prolapsing posterior compartment. The descending perineum syndrome, a term first coined by Parks<sup>30</sup>, includes all three demonstrable patho-anatomical entities; IRP, rectocele (with or without enterocele) and a descending pelvic floor (Figure 1). Again a display of three different entities of the same underlying pathology. In the Oxford pelvic floor centre IRP is regarded the central component of this commonly co-existing triad. In their experience a rectocele is uncommonly isolated (10%), and usually coexists with IRP (80%), though IRP may occasionally be seen without rectocele (10%)<sup>31</sup>. In Oxford IRP consequently has been the main object for treatment and research. The Oxford Rectal Prolapse Grade (ORPG, figure 2, table 1) has been developed for this purpose. With the ORPG one can not only determine the severity of the rectal prolapse (and subsequently choose the best treatment accordingly) but it gives a powerful instrument for research as well. Using a severity index makes it possible to study correlation or association of IRP with other entities more easily. (The ORPG is referred to in almost every chapter and therefore, for practical reasons, the diagram and table is displayed in this thesis only once in this introduction.)

The aim of this thesis is to study fundamental questions on etiology, symptomatology, pathophysiology and treatment of rectal prolapse (especially regarding IRP as a conceptual precursor of ERP) which until now often have been remained unanswered.



**Figure 1,** Descending perineum syndrome.

# Outline of the thesis

In this thesis we have tried to research and answer fundamental questions on etiology, symptomatology, pathophysiology and treatment of rectal prolapse (mainly internal rectal prolapse).

In **Chapter 2** the concept of internal rectal prolapse being a precursor of external rectal prolapse is researched by investigation of the relation of rectal prolapse grade and age.

In **Chapter 3** the symptoms of a high-grade internal rectal prolapse are described.

In **Chapter 4** the association between rectal hyposensitivity and a high-grade internal rectal prolapse is investigated.

In **Chapter 5** the association between enterocele and different grades of rectal prolapse is investigated.

In **Chapter 6** the effect of botuline injections as a treatment of radiological diagnosed anismus is described. The presence of internal rectal prolapse and its influence of treatment outcome are investigated.

In **Chapter 7** the short term results of the laparoscopic ventral rectopexy as a treatment for high-grade internal rectal prolapse are described.

In **Chapter 8** the influence of slow transit constipation on the outcome of the laparoscopic ventral rectopexy for high-grade internal rectal prolapse is investigated.

In **Chapter 9** the results are described for the laparoscopic ventral rectopexy as a treatment for external rectal prolapse in elderly patients.

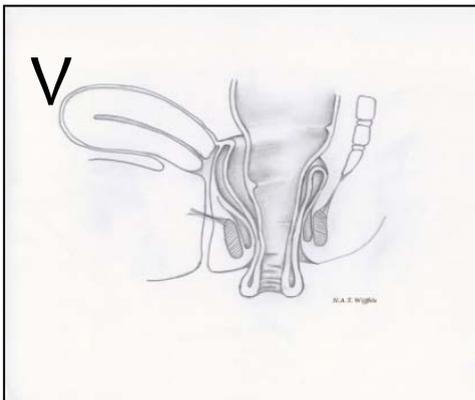
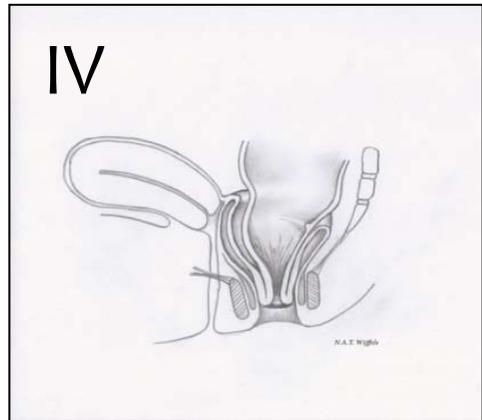
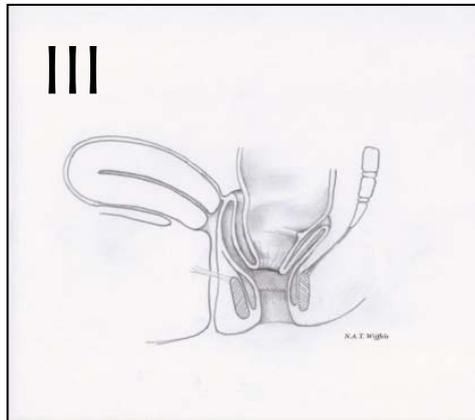
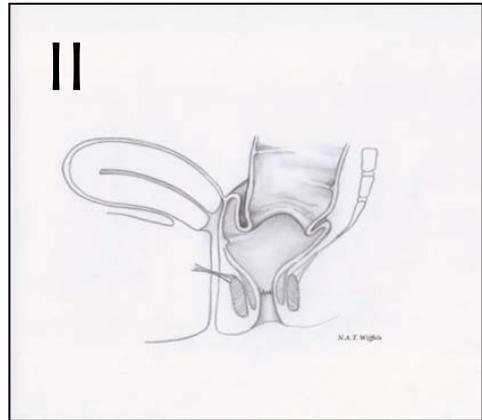
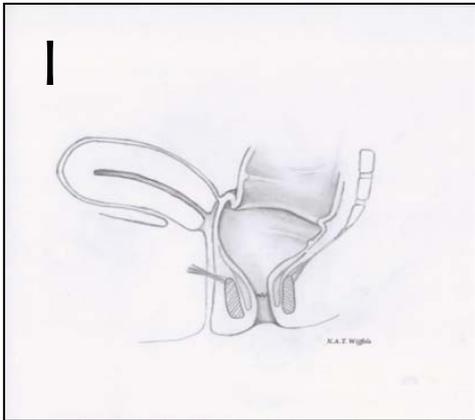


Figure 2, Oxford rectal prolapse grade, a radiologic grading system.

|                       |   | <b>Grade of Rectal Prolapse</b> | <b>Radiological characteristics of Rectal Prolapse</b>                       |
|-----------------------|---|---------------------------------|--|
| <i>Internal (IRP)</i> | <i>Recto-rectal Intussusception (RRI)</i> | I (high rectal)                 | Descends no lower than proximal limit of the rectocele.                      |
|                       |   | II (low rectal)                 | Descends into the level of the rectocele, but not onto sphincter/anal canal. |
|                       | <i>Recto-anal Intussusception (RAI)</i>   | III (high anal)                 | Descends onto sphincter/anal canal.  |
|                       |   | IV (low anal)                   | Descends into sphincter/anal canal.  |
| <i>External (ERP)</i> | <i>External rectal prolapse (ERP)</i>     | V (overt rectal prolapse)       | Protrudes from anus.   |

**Table 1,** Oxford rectal prolapse grade, a radiologic grading system.

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## **What is the natural history of internal rectal prolapse?**

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# A**bstract**

**Background:** The nature and clinical significance of internal rectal prolapse is controversial. Its natural history is unclear. Longitudinal cohort studies show rare progression to external prolapse but lack adequate follow-up. We aimed to study the relationship of age to various stages of internal rectal prolapse using the Oxford Rectal Prolapse Grade (ORPG) and evaluate the influence of sex and vaginal delivery on this relationship.

**Method:** Internal rectal prolapsed (IRP) diagnosed at proctography and external rectal prolapse were graded using the ORPG. Age, sex and obstetric history were documented. Mean age of each prolapse grade (1-5) was analyzed and regression analysis performed for age and prolapse. Subgroup analyses were made for males, and females with (V+) and without (Vo) history of vaginal delivery.

**Results:** Sixty males (11%) and 471 females (89%) were studied. The difference in the mean ages of each group was statistically significant (grade 1, 38.6; grade 2, 52.1; grade 3, 56.0; grade 4, 60.3 and grade 5, 66.5,  $p < 0.0001$ ). On average male (8.7 years) and Vo-group (8.0 years) were younger than V+ group (95% CI difference 4.5 - 12.9 years,  $p < 0.0001$ , and 3.8 - 12.2 years,  $p < 0.0001$ , respectively). Males and Vo-group had weaker correlation between age and prolapse grade ( $r = 0.16$  and  $r = 0.17$ , respectively, versus 0.41), and a faster prolapse progression rate than the V+ group.

**Conclusion:** These data demonstrate a strong relationship between age and prolapse grade, supporting the view of internal rectal prolapse as a precursor to external prolapse in the spectrum of rectal prolapse disease.

# Introduction

Rectal intussusception (RI) or internal rectal prolapse (IRP) is defined as a funnel-shaped infolding of the rectal wall that occurs during the act of defaecation. It presents classically with obstructed defaecation, yet there is ongoing debate about its clinical significance.

Several authors have suggested that IRP probably represents the first stage of a progressive anomaly that eventually leads to full thickness external rectal prolapse (ERP)<sup>1,2,3</sup>. However, two observational studies of rectal prolapse (RP) showed that progression of IRP to ERP was only rarely observed at long-term follow-up<sup>4,5</sup>. In asymptomatic volunteer-studies<sup>6,7,8</sup>, IRP has been noted to be a common cinedefaecographic finding (in up to 50% of volunteers<sup>9</sup>), thus clouding its clinical significance. The poor surgical results of posterior rectopexy lead to the abandonment of IRP surgery for 15 years and relegated IRP to a mere incidental finding<sup>10</sup>.

More recent research has shown that IRP is proctographically significantly different in symptomatic patients compared to asymptomatic individuals<sup>11,12</sup>, being deeper (recto-anal) and more commonly full-thickness. These studies suggest that previous normal volunteer studies had incorrectly included clinically insignificant mucosal and low-grade recto-rectal intussusceptions, and had overstated the frequency of true, asymptomatic recto-anal intussusceptions. Excellent functional results of the novel autonomic nerve sparing anterior rectopexy for IRP<sup>13,14</sup> have been recently achieved. These developments have all lead to a recent reappraisal of the pathophysiology of IRP.

One of the difficulties of evaluating the natural history of IRP is the lack of a widely accepted grading system. This has lead to inflexibilities in the understanding of IRP. We have developed and use a radiological grading system based on the lowest point reached by the intussusceptum in relationship to the rectum, the rectocele and the anal canal that allows sub grading of IRP for clinical and research purposes (figure 2, table 1, pages 12,13). If the natural history of IRP was one of general progression through the various grades until the appearance of ERP, it should be reflected in the different ages seen at each grade, also allowing calculation of the speed of progression thought the grades. We aimed to study the natural history of IRP by exploring any correlation between age and radiological prolapse grade using the Oxford rectal prolapse grade<sup>15</sup>.

## Method

Defaecating proctography was performed on patients attending at the pelvic floor clinic with external rectal prolapse, obstructed defaecation or faecal incontinence. Patients were included to the study if they had a full thickness rectal prolapse (ERP) or if a rectal intussusception with an intussusceptum greater than 3 mm was found on defaecating proctography. Patients with previous rectal surgery, including surgery for rectocele, enterocele and IRP, were excluded.

The proctogram technique was standardized<sup>15</sup>. Small bowel was opacified with a 310-ml mixture containing 100-ml Baritop (Barium sulphate 94.6% w / w; Sanochemia Ltd, UK) and 10-ml Gastrograffin (Schering Health Care Ltd, UK), ingested 30 min prior to the procedure. The rectum was prepared with 100 ml of E-Z-Paste (Barium sulphate cream, 60% w/w; E-Z-EM, Canada), injected per anum using a 50-ml bladder catheter-tip syringe. Lateral X-ray images were taken with the Siemens Sireskop SD image intensifier at 3 pulses/s, with the patient seated on a perspex commode. Images were taken at rest, squeeze and evacuation (for at least 30 seconds).

IRP seen on a defaecating proctogram was graded according to the Oxford rectal prolapse grade (figure 2, table 1, page 12,13), a radiological grading system. The patients' sex and age at presentation were documented. Obstetric history was documented: nullips and females with children delivered by caesarian section only were placed in the no vaginal delivery group (Vo), females with 1 or more vaginal deliveries were placed in the vaginal delivery group (V+).

The following analyses were made. The mean ages of each prolapse grade (1-5) were calculated and the differences compared with each other. A regression analysis was made for age and prolapse grade for all patients, using a simple linear regression model (the equation for a simple linear regression is  $y = a + bx$ , where  $b$  is the slope). The regression slope was used to calculate the "progression gradient" (years/prolapse grade). The flatter the slope, the faster the progression. (For example; a progression gradient of 2.5 means that it will take 2.5 years to progress to the next prolapse grade). Finally we calculated the mean rate of progression from early recto-anal intussusception (grade 3) to external prolapse (grade 5) to allow a rough form of prognostication.

Subgroup analyses were made for males, Vo and V+ females to examine the influence on sex and parity on prolapse grade. The mean ages of each prolapse grade (1-5) were calculated and the differences compared with each other across the 3 subgroups. A regression analysis was made for age and prolapse grade for subgroups. The mean rate of progression from grade 3 to 5 was calculated to allow subgroup prognostication.

We have chosen to calculate the progression from grade 3 to grade 5 because this is in our view of clinical importance. When patients present with a recto-anal intussusceptions (grade 3), depending on the severity of symptoms, a surgical procedure could be offered (compared to patients with a recto-rectal intussusception (grade 1 or 2) who in our view should be treated conservatively). Information regarding the average progression rate to a possible ERP (grade 5), of the investigated group of patients, may be very informative in the discussion about the procedure with the patient.

### **Statistical analysis**

For categorical data, results were analysed in contingency table format, using the Chi-square test. The student's t test was used for parametric continuous data. The age of the patients was correlated with prolapse grade using Pearson's correlation coefficient. Analysis of variance in mean age between different grades, using the Oxford rectal prolapse grade, was calculated using the one-way ANOVA test. Difference in mean age between different grades was calculated using the Tukey's HSD test. A p-value of 0.05 (2-sided) was considered as the limit of significance.

## **Results**

### **Patients' demographics**

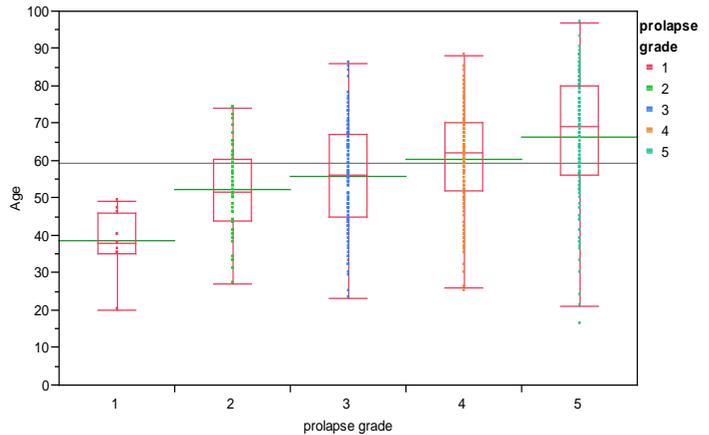
531 patients were included, 471 females (89%) and 60 males (11%). The mean age (s.d) was 59 years (15) (figure 2, table 2). Of 471 females, the obstetric history was available in 401 (85%). Sixty-eight females (17%) were in group V0 and 333 (83 %) in V+.

### **Proctographic prolapse grade**

Eleven patients (2%) had a grade 1 rectal prolapse on defaecating proctogram, 66 patients (12%) grade 2, 145 patients (27%) grade 3, 161 (30%) patients grade 4 and 148 patients (28%) with grade 5 or ERP (table 2). Sex ( $p = 0.23$ ) and obstetric history ( $p = 0.14$ ) were reasonably evenly distributed across each rectal prolapse grade.

### **Age and prolapse grade (all patients)**

For all patients, the mean age (s.d.) was 59 years (15). The mean age increased with each increase in rectal prolapse grade (figure 2). The mean age (s.d.) of patients in the grade 1 group was 38.6 (7.9); grade 2, 52.1 (11.0); grade 3, 56.0 (13.7); grade 4, 60.3 (13.4) and grade 5, 66.5 (16.1) (table 2).



**Figure 2,** All patients: mean age vs. prolapse grade. Red, Box-and-Whisker plots; green lines, average age per prolapse grade; grey line, overall average age.

|                           | total       | RRI        |             | RAI         |             | ERP         |
|---------------------------|-------------|------------|-------------|-------------|-------------|-------------|
|                           |             | gr 1       | gr 2        | gr 3        | gr 4        | gr 5        |
| number of pts             | 531         | 11 (2%)    | 66 (12%)    | 145 (27%)   | 161 (30%)   | 148 (28%)   |
| mean age (s.d.)           | 59,3 (15.0) | 38.6 (7.9) | 52.1 (11.0) | 56.0 (13.7) | 60.3 (13.4) | 66.5 (16.1) |
| median age (years)        | 60          | 38         | 52          | 56          | 62          | 69          |
| male                      | 60          | 1          | 2           | 17          | 22          | 18          |
| female                    | 68          | 3          | 9           | 24          | 20          | 12          |
| Vo                        | 333         | 3          | 49          | 93          | 108         | 80          |
| unknown obstetric history | 70          | 4          | 6           | 11          | 11          | 38          |

**Table 2,** Results.

The measured difference (variance) in the average ages of the group (grade 1-5) was statistically significant ( $p < 0.0001$ , ANOVA test). When each average age of each grade is compared individually to each other using the Tukey's HSD test, the average age in grade 1 and grade 5 are significantly different compared to the average age in all other groups, the average age of grade 2 is significantly different compared to the average age in all other groups except to grade 3, the average age in grade 3 is significantly different compared to the average age in all other groups except to grade 2 and 4, and the average age in grade 4 is significantly different compared to the average age in all other groups except to grade 3.

If patients are divided into three groups (recto-rectal intussusceptions, grade 1 and 2; recto-anal intussusceptions, grade 3 and 4; and external rectal prolapse, grade 5), the differences between different groups are even more clear. All three groups significantly differ from each other ( $p < 0.0001$ ). The correlation between age and prolapse grade was 0.37 ( $p < 0.0001$ ). The mean progression rate from grade 3 to grade 5 prolapse was 10.49 years.

## Age and prolapse grade (subgroup analysis)

### Males

There were 60 males (11%). The mean age (s.d.) of males was 51.7 years (15.2). There was a weak correlation between age and prolapse grade for males ( $r = 0.16$ ,  $p = 0.24$ ) (figures 3 & 4). The progression gradient for males was 2.5 years/prolapse grade (figure 4). Therefore the calculated mean progression rate from grade 3 to 5 was 5.0 years.

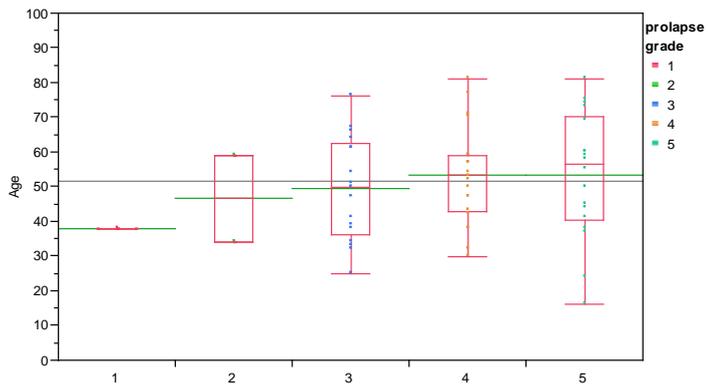
### Vo females

Of 471 females, 70 (15 %) had unavailable obstetric history. Of the remaining 401 females, 68 (17%) were in the Vo group. The mean age (s.d.) of Vo females was 52.4 years (16.4). There was a weak correlation between age and prolapse grade for Vo females ( $r = 0.17$ ,  $p = 0.16$ ) (figures 4 & 5). The progression gradient for Vo females was 2.6 years/prolapse grade (figure 4). Therefore the calculated mean progression rate from grade 3 to 5 was 5.2 years.

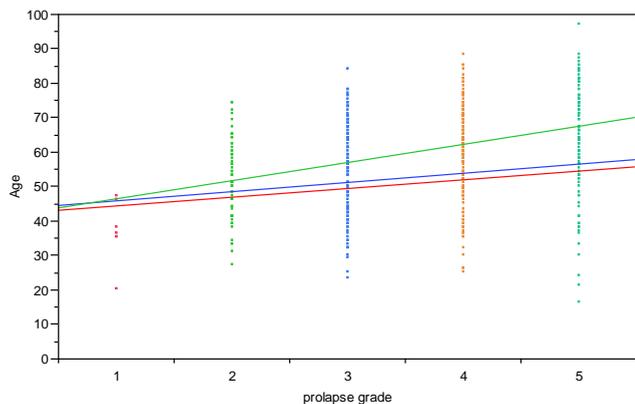
### V+ females

Of the evaluable 401 females, 333 (83%) were in the Vo group. The mean age (s.d.) of V+ females was 60.4 years (14.6). There was a correlation between age and prolapse grade for V+ females with a correlation coefficient of 0.41 ( $p < 0.0001$ ) (figures 4 & 6). The progression gradient for V+ females was 5.4 years/prolapse grade (figure 4). Therefore the calculated mean progression rate from grade 3 to 5 was 10.8 years.

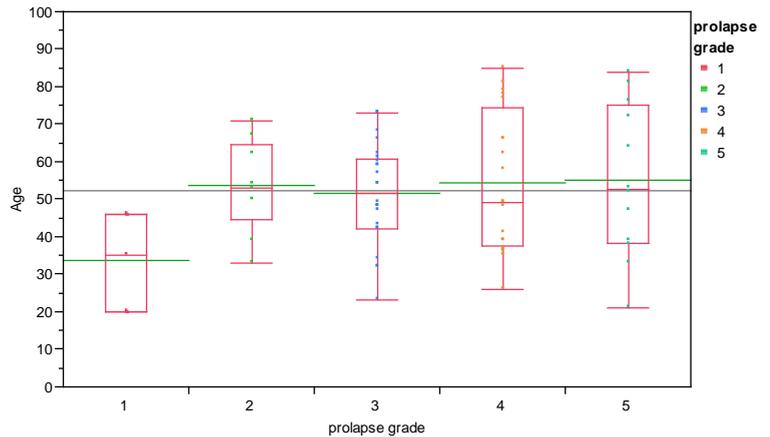
**Figure 3, Males.**  
Average age/ prolapse grade.  
Red; Box-and-Whisker plots; green lines, average age per prolapse grade; grey line, overall average age.



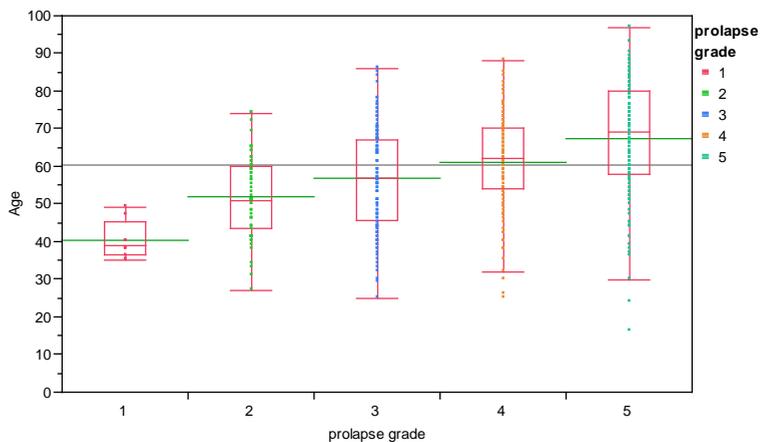
**Figure 4, Regression lines.**  
Green: V+ group,  $r = 0.41$ , slope regression line 5.4;  
Blue: Vo group,  $r = 0.17$ , slope regression line 2.6;  
Red: Males,  $r = 0.16$ , slope regression line = 2.5.



**Figure 5, Vo group.**  
Average age/  
prolapse grade.  
Red, Box-and-Whisker  
plots; green lines  
average, age per  
prolapse grade; grey  
line, overall average  
age.



**Figure 6, V+ group.**  
Average age/  
prolapse grade.  
Red, Box-and-Whisker  
plots; green lines,  
average age per  
prolapse grade; grey  
line, overall average  
age.



### Influence of vaginal delivery on age/prolapse

The Vo group was significantly younger than of the V+ group (mean age 52.4 versus 60.4 years,  $p < 0.0001$ ; difference between means 8.0 years, 95% CI 3.8 – 12.2 years). The correlation between age and prolapse grade for was stronger for V+ females ( $r = 0.41$ ) compared to Vo females ( $r = 0.17$ ). The progression gradient for Vo versus V+ females was lower (2.6 vs. 5.4 years/prolapse grade) and the calculated mean progression rate from grade 3 to 5 was faster (5.2 vs. 10.8 years) (table 3).

### Influence of sex on age/prolapse

Males were significantly younger than V+ females (mean age 51.7 versus 60.4 years,  $p < 0.0001$ ; difference between means 8.7 years, 95% CI 4.5 – 12.9 years) but not compared with Vo females (mean age 51.7 versus 52.4 years,  $p = 0.80$ ; difference between means 0.7 years, 95% CI -4.7 – 6.1 years). There was a similar correlation between age and prolapse grade for males ( $r = 0.16$ ) and Vo females ( $r = 0.17$ ), both weaker than that for V+ females ( $r = 0.41$ ). Males and Vo females demonstrated a similar progression gradient (2.5 vs. 2.6 years/prolapse grade) and therefore a calculated mean progression rate from grade 3 to 5 (5.0 vs. 5.2 years) (table 3).

|                                   | Males | Vo Females | V+ Females |
|-----------------------------------|-------|------------|------------|
| Number                            | 60    | 68         | 333        |
| Mean age (yrs)                    | 51.7  | 52.4       | 60.4       |
| SD (yrs)                          | 15.2  | 16.4       | 14.6       |
| Correlation coefficient           | 0.16  | 0.17       | 0.41       |
| Progression gradient ( yrs/grade) | 2.5   | 2.6        | 5.4        |
| Mean progress grade 3-5 (yrs)     | 5.0   | 5.2        | 10.8       |

**Table 3,** Subgroup analyses.

## Discussion

In this study a significant increase of the average age is measured with the increase of rectal prolapse (grade 1-5). There are two possible explanations. Either the groups are different, representing different pathologies, or one group precedes the other group reflecting different evolving stages of the same pathological spectrum, the group with a lower mean age precedes the group with a higher mean age. In the case of rectal prolapse, both internal and external, it is unlikely that the different stages, captured by defaecating proctography, represent different pathologies. This would imply that an external rectal prolapse would appear very suddenly without being preceded by a lower prolapse grade.

In our view this is hard to imagine. Anecdotally, our experience of laparoscopic assessment of the pelvic anatomy in over 250 patients with both external and high-grade (recto-anal) internal rectal prolapse undergoing anterior rectopexy consistently demonstrates very similar markers of prolapse disease between the two groups (exaggerated pouch of Douglas, anteriorly excavated pelvis, narrow rectum meandering on the pelvic floor, sigmoid redundancy).

We think that these data support the more likely explanation, that rectal prolapse is a gradually evolving process that passes through various radiologically identifiable stages, from high and low recto-rectal intussusception (grade 1 and 2), through high and low recto-anal intussusception (grade 3 and 4), to eventual ERP. However the rate of progression through these stages is variable, and must depend on other aetiological cofactors other than just being associated with ageing.

This conclusion contradicts the established understanding of the natural history of rectal prolapse. Mellgren et al<sup>4</sup> reported that, after operating on 41 of 79 patients with IRP, 2 out of 30 patients (8 patients lost to follow-up) developed an ERP (6.7%) after mean follow-up of 5.8 years. Choi et al<sup>5</sup>, after operating on 10 out of 36 patients, report that 1 out of 26 (3.8%) patients developed an external rectal prolapse after mean follow-up of 3.8 years. This development of IRP to ERP of 6.7% and 3.8% respectively is low but widely

accepted. It is possible that this rate might be higher if follow-up was longer. In our study the time between the mean ages of stages 3 and 5 was 10.5 years. Secondly a selection bias may play a role in these two observational studies. A total of 51 out of 115 patients (44.3%) were operated upon for IRP. Patients were not selected by randomization and therefore the possibility that the more advanced and symptomatic patients were operated on cannot be excluded and is likely.

Our study is not a longitudinal observational study and therefore no firm conclusions can be drawn regarding actual progression rates through different grades of IRP to ERP. Our conclusion is that the data support the view that an ERP is preceded by lower IRP grades. Our data are not inconsistent with these longitudinal observational studies of Mellgren et al and Choi et al. although we do think that the progression rate to ERP might be higher than reported. Mellgren et al and Choi et al stated that the results of their studies do not justify operating on patients with IRP only for the purpose to prevent a progression to ERP. Our study does not provide conclusive evidence to disagree with this statement.

Our regression graph results show a steady gradient with an incremental increase in mean age with increasing RP grade. This graph, demonstrating a correlation between age and RP grade, represents the progression of the average age of a group of patients and describes the average rate of progression for this group of patients. There clearly are other aetiological co-factors involved other than ageing, explaining the variance around this group: some patients will progress faster (flatter graph), some slower (steeper graph) and some not at all.

ERP is generally thought of as a condition of pelvic floor weakness in parous women, yet about 25% of our patients were male or nulliparous. We therefore performed subgroup analyses to examine the influence of sex and vaginal delivery on the age-prolapse relationship. When the mean ages and regression graphs of males and V<sub>0</sub> females are compared with V<sub>+</sub> females, an intriguing pattern is noticeable (figure 4 and table 3).

Firstly, the regression slopes of males and V<sub>0</sub> females are remarkably similar and both flatter than that of V<sub>+</sub> females (figure 4). Secondly the mean age of males and the V<sub>0</sub> groups is significantly different to the mean age of the V<sub>+</sub> group. It appears that when males and females without vaginal deliveries develop IRP, the progress is faster (on average about 5 years versus 10 years to progress from grade 3 to 5). This suggests both a similar pathophysiology between males and V<sub>0</sub> females on one hand, and different from that for the V<sub>+</sub> females on the other.

We are aware however of the limitations of our study. The correlation, between age and prolapse grade, found in the subgroup analysis for males and V<sub>0</sub> group was not very strong. The regression lines in these two subgroups are rough estimations. Therefore no firm conclusion can be drawn on the calculated progression rates. The number of patients in these subgroups is probably insufficient to find a strong correlation especially

when keeping in mind that correlation is harder to prove in a flatter regression line, which represents faster regression rate in our study. The significant difference found in mean age between males and Vo group compared with the V+ however is undeniable, expressing a true difference between the males and Vo group on the one hand and the V+ group on the other. Looking at the regression lines we think that this difference is caused by a faster progression in the development in rectal prolapse. If they reach the higher grades sooner the overall average age will be lower.

Various factors that weaken the pelvic floor are believed to contribute to pelvic floor prolapse<sup>16</sup> and rectal prolapse<sup>17</sup>. These include ageing, obstetric trauma associated with vaginal deliveries and connective tissue changes associated with the menopause. Why should males and Vo females develop IRP and ERP with faster progression than V+ females? Karasick et al<sup>18</sup> found a higher incidence of nulliparous females in a group of patients with ERP than in a control group without ERP (30% versus 15%), suggesting another cause in the development of rectal prolapse. A possible explanation might be a difference in collagen distribution or a connective tissue disorder. An interesting study done by Marshman et al<sup>19</sup> who found a significant difference in joint mobility between patient operated for ERP and an age- and sex-matched control group, suggesting a connective tissue disorder may play a role in the development in RP. Keane et al found an abnormal ratio of type 1 to type 3 collagen in nulliparous patients compared to parous females with genuine stress urinary incontinence<sup>20</sup>. Our data support further enquiry into the role of abnormal connective tissue in the development of RP.

Because several normal volunteer studies showed that IRP is frequently seen in asymptomatic patients<sup>6-9</sup>, the concept of IRP as a precursor of ERP has been controversial. Pomerri et al.<sup>10</sup> and Dvorkin et al.<sup>11</sup> have both shown that IRP is significantly different in morphology in symptomatic compared with asymptomatic patients. Pomerri et al. showed that intussusception thickness and the ratio between the intussusciens diameter and the intussusceptum lumen was significantly greater in symptomatic subjects than in asymptomatic controls. However the group was heterogeneous, containing patients with multiple pelvic floor symptoms and morphological abnormalities. Dvorkin et al. on the other hand studied a more homogeneous group of patients in which the only abnormality found on evacuation proctography was rectal intussusception. They found that patients with symptoms of obstructed defaecation (as defined by the Rome II criteria) had a significantly thicker intussusceptum and that the presence of an occluding intussusception was significantly higher compared to asymptomatic patients. The intussusception was predominantly full thickness in symptomatic patients and mucosal in asymptomatic patients. Patients with symptoms of obstructed defaecation will have in about 40% an IRP identified on proctography<sup>12,21</sup>. The studies of Pomerri et al. and Dvorkin et al. show an association between severity/degree of rectal prolapse and symptoms. Fleschman et al.<sup>22</sup> showed in 1989 that in high-grade IRP manometric findings were similar to patients with ERP,

suggesting a similar pathophysiology. Our data support the concept of IRP as a precursor of ERP. It is now apparent that IRP seen on a defaecating proctogram in a small number of asymptomatic volunteers is quite different from IRP seen proctographically in symptomatic patients. Patients need to be interviewed very thoroughly to pick up symptoms most sensitive for IRP<sup>23</sup>. Defaecography should be analysed together by a trained team of colorectal surgeons and radiologists.

We are aware that our study does not give a clear definite answer on the debate whether the more severe rectal prolapse (high-grade internal or external) will cause more severe symptoms. Unfortunately we did not collect data on the severity of symptoms per grade, the duration of symptoms per patient and finally the progression of symptoms in time. Collecting these data would be very interesting in future research. In this study we have only investigated the association between age and degree of rectal prolapse. But from our collected data we do conclude that IRP seems to be a precursor of ERP. If our results are combined with those from the studies of Dvorkin and Pomeri<sup>10,11</sup> a more clearer view on the natural history of internal rectal prolapse seems to arise. Rectal prolapse might begin as a trivial probably asymptomatic “low grade” rectal prolapse which can be an epidemiologically very large group. This group of asymptomatic patients in our view might be patients with an IRP seen on proctography described in the normal volunteer studies. At least some of these patients will develop a morphologically and anatomically more progressed “high-grade” (internal) rectal prolapse which is then more likely to give symptoms of obstructed defaecation and faecal incontinence<sup>15</sup>. Finally ERP might be an end stage in elderly patients (or earlier in patients with a certain connective tissue disorder) where at this stage symptoms of discomfort of the prolapsed rectum itself, consisting of pain, bleeding and mucous discharge, are often combined with pre-existing functional symptoms.

Interestingly we know that in about 80 percent of all patients with ERP will have functional symptoms at time of presentation (unpublished data of cohort of patients with ERP at John Radcliffe Hospital). This leaves 20 percent of patients with ERP without symptoms. In those cases the ERP will appear very suddenly as a lump without any functional symptoms in the past. To draw a parallel to IRP, assuming that ERP is preceded by IRP, it is likely that not all patients with (high-grade) IRP will be symptomatic. Again these asymptomatic patients with (high-grade) IRP might have been picked-up with the normal volunteer studies. The debate about whether IRP is causing symptoms or not is in our view becoming more and more obsolete. With the possibility that IRP might be either symptomatic or asymptomatic, the more interesting question would be “what is the ratio of symptomatic and asymptomatic patients in patients with IRP as seen on proctography” and “is this ratio influenced by the severity or grade of rectal prolapse (internal and external)”.

## Conclusion

These data demonstrate a strong relationship between age and prolapse grade, supporting the view of internal rectal prolapse as a precursor to external prolapse in the spectrum of rectal prolapse disease. Since the subgroups males and females without a history of vaginal delivery seem to develop prolapse faster another cause in the development of rectal prolapse needs to be postulated. A collagen disorder, implicated in previous work, warrants closer scrutiny.

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## **What are the symptoms of internal rectal prolapse?**

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# Abstract

**Aim:** Although high-grade internal rectal prolapse is believed to cause functional symptoms such as obstructed defaecation, little has been published on the exact distribution and frequency of symptoms. The aim of this study was to identify the most common symptoms of patients with high-grade internal rectal prolapse.

**Method:** Patients were diagnosed with high-grade prolapse (grade 3 and 4) on proctography using the Oxford Rectal Prolapse Grade. Information from a prospectively collected database was supplemented by retrospective case note review.

**Results:** Eighty-eight patients (94% female) were included for analysis. Faecal incontinence (56%) was the most common symptom at presentation. Symptoms related to obstructed defaecation syndrome were the next most common, including incomplete evacuation (45%), straining (34%), digital assistance (34%) and repetitive toilet visits (33%).

**Conclusion:** A variety of symptoms may be caused by high-grade internal rectal prolapse. Although symptoms of obstructed defaecation were frequent, urge faecal incontinence was the most common.

# Introduction

Patients with an evacuatory disorder, or obstructed defaecation, complain of a wide range of symptoms. Obstructed defaecation is identified as a subset of functional constipation, differing from slow transit constipation both as regards symptoms and pathophysiology, although obstructed defaecation and slow transit constipation may co-exist in the same patient<sup>1</sup>. Despite the overlap, it is said one can distinguish between obstructed defaecation and slow transit constipation by stool frequency. A patient with isolated slow transit constipation will predominantly complain of infrequent bowel actions (< 2 /week), patients with isolated obstructed defaecation will generally have more than one defaecation (or attempt) per day.

A wide range of pelvic floor abnormalities is recognized to cause obstructed defaecation including internal rectal prolapse (IRP), rectocele and anismus. Defaecating proctography is regarded as the “gold standard” investigation to differentiate<sup>2,13</sup> between these disorders. Symptoms often overlap<sup>3</sup> and obstructed defaecation and slow transit constipation often co-exist. It is therefore difficult to identify symptoms specific to one form pelvic floor abnormality<sup>4</sup>.

IRP is a full-thickness intussusception of the rectum during defaecation. It can be classified according to severity with the Oxford Rectal Prolapse Grade (figure 2, table 1, pages 12,13). It often co-exists with a rectocele and/ or an enterocele<sup>4,5,13</sup>. In patients with high-grade IRP failing conservative treatment, surgery might be considered. Nerve-sparing laparoscopic ventral rectopexy has been described for *external* rectal prolapse<sup>6-9</sup>, and has excellent long term results and good functional improvement. Laparoscopic ventral rectopexy has also been applied to treat IRP with success<sup>10,11</sup>.

Obstructed defaecation symptoms include straining, incomplete evacuation, digitation, frequent visits to the toilet, often for long periods of time. None is specific for IRP alone<sup>4</sup>.

Recently faecal incontinence has been recognised to be associated with IRP<sup>12</sup> and patients may also complain of pain, mucous discharge and anal bleeding. The co-existence of other disorders such as hemorrhoids, mucosal prolapse and solitary rectal ulcer can confuse the symptomology. Current scoring systems such as the Wexner constipation score may under diagnose the severity when applied to IRP. In this study we aimed to identify the most common symptoms of patients presenting with a high-grade IRP.

## Method

We included all patients attending our pelvic floor clinic between January 2005 and April 2008, with a high-grade (grade 3 or 4) IRP assessed on proctography using the Oxford Rectal Prolapse Grade (figure 2, table 1, page 12,13). Analysis was performed on all patients with obstructed defaecation, faecal incontinence or unexplained perineal pain. They were identified from a prospectively maintained database, supplemented by case note review. To avoid including symptoms not directly connected to IRP, a symptom was only included if it was present in four or more patients. Faecal incontinence symptoms were divided into urge, passive and flatus incontinence. The Wexner constipation score and the faecal incontinence severity index (FISI score) had been recorded prospectively in all patients. A cut off of 5 or more for the former was used to define the presence of obstructed defaecation. All patients had had a sigmoidoscopy or colonoscopy. Soiling was not regarded as a symptom of faecal incontinence. In this study its use indicated that the patient complained of a “wet anus” due to a discharge of moisture or mucus *per anum*.

Defaecating proctography was standardized<sup>12</sup>. The small bowel was opacified with a mixture containing 100-ml Baritop (Barium sulphate 94.6% w/w; Sanochemia Ltd, UK) and 10-ml Gastrograffin (Schering Health Care Ltd, UK), ingested 30 min prior to the procedure.

The rectum was prepared with 100 ml of E-Z-Paste (Barium sulphate cream, 60% w/w; E-ZEM, Canada), injected *per anum* using a 50-ml bladder syringe. Lateral images were taken with the Siemens Sireskop SD image intensifier at 3 pulses, with the patient seated on a perspex commode at rest, squeeze and evacuation, (for at least 30 seconds).

## Results

Eighty eight (female 94%) patients with a grade 3 or 4 IRP were included. Their average age was 57.2 (SD +/- 13.9) years.

Twenty one different symptoms were identified (Table 1). In order of descending frequency, the commonest five symptoms were faecal incontinence, incomplete evacuation, straining, digital assistance and repetitive visits to the toilet. Faecal incontinence and/or incomplete evacuation was present in 84% (Table 2).

| Symptom                            | N  | Percentage |
|------------------------------------|----|------------|
| Faecal Incontinence (FI)           | 49 | 56%        |
| Incomplete Evacuation              | 40 | 45%        |
| Straining                          | 31 | 34%        |
| Digital assistance                 | 30 | 34%        |
| Repetitive toilet visits           | 29 | 33%        |
| Soiling                            | 22 | 25%        |
| Mucus Discharge                    | 21 | 24%        |
| Peri-anal Bloodloss                | 21 | 24%        |
| Rabbit- pellet-shaped droppings    | 20 | 23%        |
| Bloating                           | 20 | 23%        |
| Feeling of Obstruction             | 19 | 22%        |
| Abdominal Pain                     | 18 | 20%        |
| Anal Pain                          | 17 | 19%        |
| Laxative Use                       | 14 | 16%        |
| Post Defaecatory Cleaning Problems | 10 | 11%        |
| Feeling of prolaps                 | 9  | 10%        |
| Peri-anal Itch                     | 7  | 8%         |
| Unsuccessful Attempts              | 6  | 7%         |
| Diarrhoea                          | 5  | 6%         |
| Change in Bowel Habit              | 5  | 6%         |
| Haemorrhoids                       | 4  | 5%         |

**Table 1,** Twenty-one different symptoms were identified in our cohort of patients.

### Obstructed defaecation

The mean Wexner constipation score was 10.7 (+/-5,2). Seventy five (85%) patients had obstructed defaecation, with a mean Wexner constipation score of 12.2 ( +/- 4.0). If symptoms of incomplete evacuation, straining, repetitive toilet visits, digital assistance, feeling of obstruction, laxative use or unsuccessful attempts were defined as symptoms of obstructed defaecation, 65 (74%) patients were identified as having obstructed defaecation.

| Patients with..     | Percentage |
|---------------------|------------|
| 1 of top-5 symptoms | 94%        |
| 1 of top-4 symptoms | 94%        |
| 1 of top-3 symptoms | 90%        |
| 1 of top-2 symptoms | 84%        |
| top symptom         | 56%        |

**Table 2,** Percentage of patients with one of x top symptoms.

### Faecal Incontinence

The mean FISI score was 23.4 (+/- 16.4). Forty nine (56%) patients presented with symptoms of faecal incontinence. Of these we were able to identify the type in 37 (76%). Urge was most common (73%) with passive (35%) and flatus incontinence (27%) being observed less often. All combinations of the different types of faecal incontinence were seen (Table 3). Only one type of faecal incontinence was present in 26 (70%) of patients whereas a combination was seen in 11 (30%).

|  | Perc. of total | Perc. of patients with FI* |
|--|----------------|----------------------------|
| Faecal Incontinence:                   | 56% (49/88)    |                            |
| FI without differentiation:            | 14% (12/88)    |                            |
| FI with differentiation:               | 42% (37/88)    |                            |
| Urge FI**:                             |                | 51% (19/37)                |
| Passive FI**:                          |                | 14% (5/37)                 |
| Incontinence for flatus**:             |                | 5% (2/37)                  |
| Combi passive and urge FI:             |                | 8% (3/37)                  |
| Combi passive and Flatus FI:           |                | 8% (3/37)                  |
| Combi flatus and urge FI:              |                | 8% (3/37)                  |
| Combi passive and urge and flatus FI : |                | 5% (2/37)                  |
| Urge FI***:                            |                | 73% (27/37)                |
| Passive FI***:                         |                | 35% (13/37)                |
| Incontinence for flatus***:            |                | 27% (10/37)                |

**Table 3,** The different types of faecal incontinence categorized.

\* Differentiated FI

\*\* As a sole symptom, not in combination with another type of FI

\*\*\* As a sole symptom or in combination with another type of FI

## Discussion

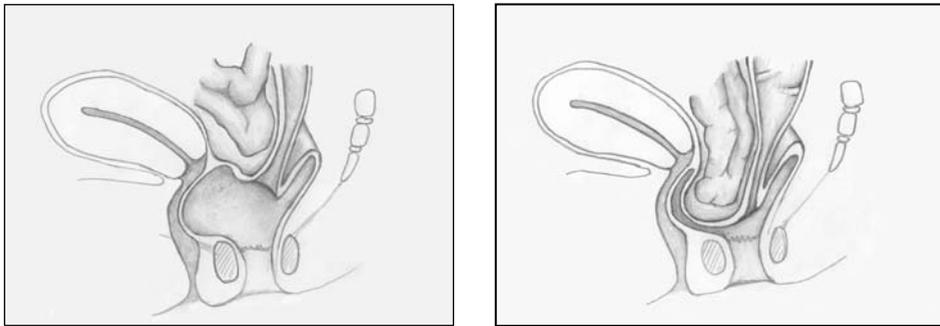
There have been few studies of symptoms and their frequency in internal rectal prolapse. Dvorkin et al<sup>4</sup> studied a large group of patients with obstructed defaecation by proctography, and tried to differentiate the symptoms of IRP and rectocoele. The most frequent symptoms in the former with or without rectocoele, in descending order were incomplete evacuation, difficulty of evacuation, straining, faecal incontinence (IRP alone) and laxative use (IRP and rectocoele) and laxative use (IRP alone) and infrequency (IRP and rectocoele).

Despite some similarities with our study, there are two significant differences. First the inclusion criteria differed as the patients of Dvorkin et al had “symptoms suggestive of rectal evacuatory disorders” whilst we included all patients with symptoms suggestive of “functional proctological disorders” including faecal incontinence which may explain why it.

Faecal incontinence was the most frequent symptom in our study. Faecal incontinence has only recently been acknowledged as a feature of IRP and most centers do not routinely perform proctography in patients with faecal incontinence. In a previous study from our unit of 40 patients with unexplained faecal incontinence, 25 (63 %) were found to have a high-grade IRP on proctography<sup>12</sup>. Secondly Dvorkin et al used the symptoms of the Rome II criteria apart from “sensation of bulging”, “sensation of prolapse”, “toilet revisiting” and “digitation”. In contrast we included all symptoms as described by

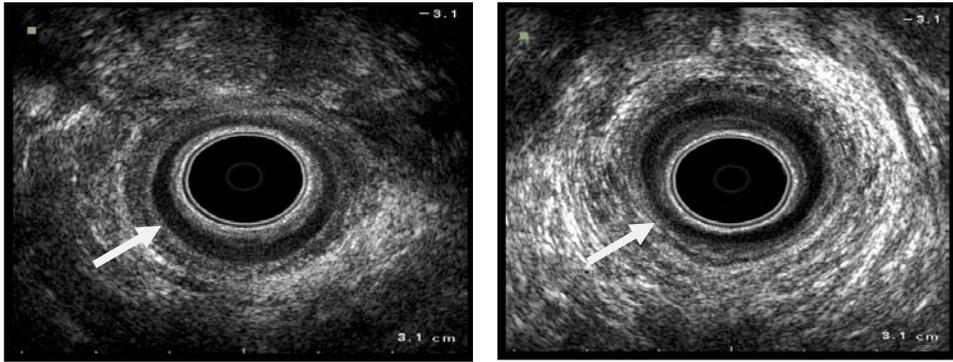
patients. We also tried to avoid overlapping symptoms, for example, by not including the symptom “difficult evacuation” because “straining”, “incomplete evacuation” and “feeling of obstruction” are covered by this term.

Dvorkin et al tried to differentiate symptoms caused by rectocele, IRP or a combination of both. The numbers for each group were isolated rectocele (100 (27%)), isolated IRP (125 (33%)) and both rectocele and IRP (152 (40%)). Differentiation between rectocele, IRP and enterocele may be illogical as each is caused by the same pathology, namely prolapse of the posterior pelvic floor compartment (Figure 2). We believe that rectocele unusually occurs in isolation. Complete evacuation on defaecating proctography is mandatory to identify the ventral prolapsing rectal wall. A similar phenomenon is seen for enterocele, which is increasingly identified with the severity of the rectal prolapse<sup>5</sup>.



**Figure 2**, Co-existent internal rectal prolapse, rectocele and enterocele. Before and after (complete) evacuation.

In the present study, faecal incontinence was the most common symptom in high-grade IRP, with the majority complaining of urge incontinence. Passive faecal incontinence suggests dysfunction of the internal anal sphincter (IAS). It is known that in full thickness rectal prolapse it is changed<sup>14</sup>. It becomes thickened in an asymmetrical manner often with thickening of the submucosa (figure 3). In a large study, Harmston et al.<sup>15</sup> have shown that in IRP there is a significant reduction in resting pressure with increasing grade of prolapse. It is possible that high-grade IRP may trigger the recto-anal inhibitory reflex (RAIR) leading to passive leakage as previously suggested by Farouk et al.<sup>17,18</sup>. These authors found an improvement of IAS physiological function after rectopexy suggesting that repair of the prolapse allows the IAS to recover possibly by removing the source of the internal sphincter inhibition.



**Figure 3,** Images of an endo-anal ultrasound. An example of an asymmetrical thickened IAS in a patient with high-grade IRP (white arrow).

Urge faecal incontinence in IRP is harder to explain and its high frequency in the present study was surprising. This finding was at variance with that of Harmston et al who did not find a relationship between squeeze pressure and IRP<sup>15</sup>. A possible explanation for urge incontinence in IRP could be due to subclinical damage to the EAS during delivery. An increasing grade of prolapse might lead to increased activation of the RAIR, for which a weakened EAS would find difficult to compensate. Urge faecal incontinence is, however, found in patients with an intact anal sphincter suggesting that a sphincter defect alone is not the explanation<sup>19,20</sup>. Parks et al.<sup>16</sup> postulate that denervation of the muscles of the anorectal sling and of the anal sphincter, as shown in biopsies, may be the cause of idiopathic faecal incontinence in patient with ERP. In our experience faecal incontinence is often restored very quickly after laparoscopic ventral rectopexy. This would suggest an anatomical cause rather than denervation of the sphincter, which might be expected to take a long time to recover after surgery, if it did so at all. Anatomical causes such as the intussusceptum (which is corrected instantaneously by rectopexy) seem, in our opinion, to play a large role in the pathophysiology in patient with urge faecal incontinence and high-grade IRP. Other explanations might include a reduction in rectal wall compliance, due to chronic irritation, of the prolapsing rectal wall. This is thought to underlie the urge faecal incontinence after a transanal mucosectomy<sup>21</sup> or transanal resection of the rectum (STARR)<sup>22</sup>.

Although faecal incontinence was the most common symptom in IRP with a prevalence of about 50%, a sense of incomplete evacuation, straining, repetitive toilet visits, digital assistance, feeling of obstruction, laxative use or unsuccessful attempts at defaecation were found in three quarters of patients. In conclusion the study has shown that a large variety of symptoms is seen in high-grade IRP. Faecal incontinence is the commonest at presentation including urge faecal incontinence as most frequent. Otherwise symptoms of obstructed defaecation are among the five most common symptoms.

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**Rectal hyposensitivity is uncommon in patients with obstructed defaecation and high-grade internal rectal prolapse**

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# Abstract

**Background:** There are several causes of obstructed defaecation one of which is thought to be internal rectal prolapse. Operations directed at internal prolapse, such as laparoscopic ventral rectopexy, may improve obstructed defaecation symptoms significantly. It is not clear whether the obstructed defaecation with internal prolapse is a mechanical phenomenon or whether it results changes in rectal sensitivity. This study aimed to evaluate rectal sensory function in patients with obstructed defaecation and high-grade internal rectal prolapse.

**Method:** This study represents a retrospective review of a prospectively collected database of patients attending a tertiary referral pelvic floor unit. Patients with high-grade (recto-anal) intussusception formed the basis of this study. Rectal sensory function was determined by intra-rectal balloon inflation. Three parameters (sensory threshold, urge to defaecate and maximum tolerated volumes) were recorded. Abnormal sensitivity was defined as partial (one or two parameters abnormal) or total (all three abnormal).

**Key Results:** 408 patients with high-grade internal rectal prolapse both with and without obstructed defaecation symptoms were studied. 241 (59%) had normal sensation. 18 (4%) had total hyposensitivity and 3 (1%) total hypersensitivity. A further 96 (24%) had partial hyposensitivity whilst 50 (12%) had partial hypersensitivity. Neither hypersensitivity nor hyposensitivity differed between patients with and without symptoms of obstructed defaecation.

**Conclusion and Inferences:** Rectal hyposensitivity is relatively uncommon in patients with high-grade internal rectal prolapse and obstructed defaecation. Internal rectal prolapse may cause obstructed defaecation through a mechanical process. It does not appear that rectal hyposensitivity plays a significant part in the pathological process.

# Introduction

Obstructed defaecation is a common problem with an estimated prevalence of 2-10%.<sup>1,2</sup> The pathophysiology of obstructed defaecation is multifactorial though internal rectal prolapse has been recognised as one of its major causes.<sup>3</sup> Internal rectal prolapse, also known as incomplete rectal prolapse or rectal intussusception, is defined as the protrusion of the full thickness of the wall of the rectum into the rectal lumen or anal canal.<sup>4</sup> Whilst clinical examination may raise suspicion, the most common route of diagnosis is by defaecating proctography.<sup>5</sup>

The importance of sensory abnormalities in pelvic floor dysfunction has been recognized for almost sixty years.<sup>6</sup> The use of the rectal balloon distension to examine the rectal sensory perception and rectal wall contractility has been present for over three decades<sup>7</sup> and it is now routinely used in clinical practice<sup>8</sup> as part of the physiological assessment. Three main volume or pressure parameters are usually measured. This includes sensory threshold volume, urge to defaecate volume and maximum tolerable volume. Disorders of rectal sensation are found in around one sixth of patients who come for anorectal physiological assessment.<sup>9</sup>

Whilst internal rectal prolapse is recognized to cause obstructed defaecation, the mechanism by which it does this is unclear. This could be a mechanical phenomenon but might also be through changes in rectal sensitivity. This paper reports on the incidence of abnormalities in rectal sensation amongst patients with high-grade internal rectal prolapse investigated in our unit.

## Method

The study comprised patients with high-grade internal rectal prolapse on defaecating proctography or at examination under anaesthetic. Rectal prolapse was graded using the Oxford Rectal Prolapse Grade (figure 2, table 1, page 12,13)<sup>10</sup>. High-grade internal rectal prolapse was defined as those with Oxford Rectal Prolapse Grade 3 or 4 (recto-anal intussusception). Patients were identified from a prospectively collected database that also included information on symptom scores and physiological parameters.

Patients were studied in the left lateral position as part of standard physiological testing. No bowel preparation was used. A latex balloon was inserted into the rectum at 10cm from the anal verge. This was inflated with air at a rate of 1ml/sec. Patients were asked to state when they first felt the balloon expanding in their rectum (sensory threshold

volume; normal range 20-70ml in our unit), when they first appreciated the sensation that they needed to open their bowels (urge to defaecate; normal range 35-120ml) and the volume at which they were unable to tolerate further balloon inflation (maximum tolerable volume; 100-260ml). Rectal hyposensitivity was defined as “partial” if there was the elevation of one or two of the three sensory parameters above the normal range or “total” if all three parameters were elevated. Similarly, total rectal hypersensitivity was defined as reduction in all three sensory threshold volumes below the normal range, whilst partial hypersensitivity was defined as an abnormality in one or two of these parameters. Non-parametric data were compared using Fisher’s exact test. A p-value of less than 0.05 was considered statistically significant.

## Results

### Demographics

408 Patients (359 (88%) female, 49 (12%) male) with Grade 3 or 4 internal rectal prolapse were identified. The mean age of the study group was 59 years (range 19-90). 294 patients (72%) had obstructed defaecation symptoms and 114 (28%) did not. 81 (71%) of these patients with non-obstructed defaecation symptoms were complaining of pure faecal incontinence.

### Sensory abnormalities

241 Patients (59%) had normal sensation (all three sensory parameters in the normal range). 18 patients (4%) had complete hyposensitivity (all three sensory parameters abnormal above the normal range). 96 (23%) Patients had partial hyposensitivity (52 patients with a single abnormal parameter, 44 with two abnormal parameters). 3 Patients (1%) was complete hypersensitive with all three parameters abnormal and 50 (12%) had partial hypersensitivity (37 with a single abnormal parameter, 13 with two abnormal parameters). These results are summarised in table 2.

| Sensation      | No. of abnormal parameters | No. Of patients | Overall percentage (%) |
|----------------|----------------------------|-----------------|------------------------|
| Normal         | 0                          | 241             | 59                     |
| Hypersensitive | 1                          | 37              | 9                      |
|                | 2                          | 13              | 3                      |
|                | 3                          | 3               | 1                      |
| Hyposensitive  | 1                          | 52              | 13                     |
|                | 2                          | 44              | 11                     |
|                | 3                          | 18              | 4                      |

**Table 2**, Summary of the prevalence of sensory abnormalities in the study group (sensory threshold volume, urge to defaecate and maximum tolerated volume).

### **Obstructed defaecation versus non-obstructed defaecation symptoms**

Of the 294 patients with obstructed defaecation symptoms, 84 (28%) displayed partial or complete hyposensitivity. By comparison, of the 114 patients without obstructed defaecation symptoms, 29 (25%) had partial or complete hyposensitivity. The proportion of patients with hyposensitivity did not differ between these groups ( $p=0.62$ ).

Partial or complete hypersensitivity was seen in 38(13%) of the patients with obstructed defaecation as compared to 16 (14%) of the patients without these symptoms. This was not statistically significant ( $p=0.75$ ).

## **Discussion**

Rectal hyposensitivity could reflect either an impaired afferent nerve pathway or the presence of abnormal rectal wall properties. Our study suggests that in patients with internal rectal prolapse and obstructed defaecation, hyposensitivity occurs in only a minority. Of the patients with “abnormal sensation”, many had only one of three parameters outside the normal range and may have been exhibiting little more than normal population variation.

There are a number of methods of assessing rectal sensation other than balloon inflation used in this study. One such technique is the measurement of rectal mucosal electrosensitivity.<sup>11</sup> The reproducibility of this method has been questioned, however, with a report suggesting that there is variability depending on the circumferential position of the electrode and the presence of faeces.<sup>12</sup> Another alternative involves the use of a barostat. This maintains a constant pressure within an air-filled bag usually made of polythene by means of a computerized feedback mechanism during rectal distension. This helps to overcome issues of rectal capacity and compliance during rectal distension, which may be an issue in some patient subgroups such as those with mega rectum. There are some studies that suggest that the measurement of sensation by simple balloon inflation does not correlate well with assessment using a barostat in healthy volunteers.<sup>13</sup> Furthermore, this discrepancy might be even more marked when one considers patients with rectal hyposensitivity.<sup>14</sup> However, simple balloon inflation has been and continues to be the most commonly employed method of assessing rectal sensation in clinical practice.

Several studies report rectal sensation in various groups of patients with a range of functional symptoms. Gladman et al.<sup>15</sup> reported the prevalence of rectal hyposensitivity in patients with different functional problems. They used balloon distension and defined hyposensitivity as in this study (one or more of the three sensory thresholds elevated).

Of those patients with symptoms of constipation, the authors divided them into patients with infrequency of defaecation and obstructed defaecation or a combination of the two. They reported rectal hyposensitivity in 8/42 (19%) of patients with stool infrequency. This contrasted with 50/250 (20%) of patients with obstructed defaecation and 44/146 (30%) of patients with a mixture of both findings. In patients with intussusception on proctography and symptoms of obstructed defaecation, rectal hyposensitivity was seen in 25/62 (40%).

Gosselink and Schouten<sup>16</sup> studied rectal sensation in women with obstructed defaecation using a barostat. They found significant differences in the median values of all three sensory parameters for patients with obstructed defaecation compared to controls, though they did not give data on the percentages of patients with hyposensitivity. Interestingly, they found that rectal sensitivity was no different between patients with slow transit compared to those with normal transit.

By comparison, our study has shown hyposensitivity to be less common in obstructed defaecation. There might be a number of explanations for this including differences in the referral patterns of patients for investigation and variation in the methodology of testing for rectal sensation. In our study, only patients with recto-anal intussusceptions were included. In the study of Gladman et al., the authors report that rectal intussusception was sometimes classified as normal if it “appeared to be clinically insignificant and did not constitute a physical obstruction”.

Whilst these studies show an association between obstructed defaecation and rectal hyposensitivity, the relationship between the two is not clearly understood. In particular, it is not known if obstructed defaecation cause rectal hyposensitivity. Straining may cause a stretching of the pudendal or hindgut autonomic nerves, resulting in a neuropathy.<sup>17</sup> This might then precipitate the rectal hyposensitivity.<sup>18</sup> Alternatively, it is possible that the rectal hyposensitivity is the cause of the obstructed defaecation. Schouten et al.<sup>19</sup> showed that the mean distending volume required to elicit an urge to defaecate was significantly greater in patients with obstructed defaecation compared to normal controls. In all control patients in this study, evocation of the urge to defaecate induced a pronounced increase in rectal tone, proximal to the distal stimulating balloon. This increase in rectal tone was significantly higher in control subjects as compared to those with obstructed defaecation.

There are a number of surgical techniques which have been developed for the treatment of obstructed defaecation. These techniques differ considerably and range from perineal to abdominal procedures. Most prominent amongst the perineal techniques has been a new operation that uses the circular stapler for the specific management of this condition, STARR.

Since its development, a prospective study of 90 patients has shown the STARR procedure to be a quick technique to perform, with short recovery times and effective at reducing obstructed defaecation symptoms.<sup>20</sup> This has been supported by a number of other studies.<sup>21,22, 23,24</sup> STARR is not without risk, however.<sup>25</sup> Some of these complications result from the resectional nature of STARR (bleeding, anastomotic dehiscence and sepsis) whilst others are a result of perineal instrumentation and anal dilatation (faecal incontinence). Inappropriate positioning and firing of the staplers can cause damage to other structures including the vagina (rectovaginal fistula) and small bowel, especially in patients with an enterocele.

Part of the proposed mechanism by which this stapled transanal resection of rectum (STARR) procedure works is said to be through resection of the 'hyposensitive' portion of the rectum. This is said to restore rectal compliance and decrease the rectal sensory threshold in patients with obstructed defaecation.<sup>26</sup> Resection of the hyposensitive rectum would be difficult to achieve via an abdominal approach as it would involve essentially a very low anterior resection with all its attendant surgical risk and functional disturbance.

This study suggests that rectal hyposensitivity is not a prominent feature of most patients with obstructed defaecation. Anatomical abnormalities, such as internal rectal prolapse, rectocele and enterocele, may be more important. This might explain laparoscopic ventral rectopexy, which restores normal anatomy without removing the hypo-sensitive mucosa, has good functional results when undertaken in patients with obstructed defaecation and internal prolapse.<sup>27,28</sup>

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## **Enterocoele is a marker of severe pelvic floor weakness**

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*Colorectal Disease 2010; 12(7 Online):e158-62*



# A**bstract**

**Objective:** The aim was to evaluate the relationship between the presence of an enterocele and severity of rectal prolapse grade.

**Method:** Defaecating proctograms of consecutive patients presenting to the Oxford Pelvic Floor Clinic between January 2004 and November 2008 were analysed. Patients were included if they had full thickness internal [grades 1-4 prolapse] or external rectal prolapse [grade 5 prolapse]. All those included were analysed with regards the presence of an enterocele.

**Results:** 371 patients (322 (87%) female and 49 (13%) male) were found to have a degree of rectal prolapse (RP). 1/8 (13%) patients with grade 1 RP, 10/54 (19%) with grade 2 RP, 34/125 (27%) with grade 3 RP, 62/135 (46%) with grade 4 RP and 23/49 (47%) with grade 5 full thickness external RP had an enterocele present. This was a statistically significant trend (Pearson  $\chi^2$  test  $p < 0.0002$ ). There was a significantly higher proportion of enteroceles in women (125/322 (39%)) than in men (5/49 (10%)) ( $p < 0.0001$ ) and a higher likelihood of having an enterocele with advancing age ( $p < 0.0001$ ). Within the study, there was no significant difference in the proportion of nulliparous and parous women with enteroceles ( $p = 0.8$ ); there were a significantly higher proportion of enteroceles in hysterectomised women ( $p = 0.015$ ).

**Conclusion:** Enterocele is increasingly seen with advancing rectal prolapse severity. This suggests the two findings are part of the same pelvic floor process. These data support the hypothesis that enterocele is a marker of severe pelvic floor weakness. Enterocele is seen more frequently in females particularly after hysterectomy.

# Introduction

An enterocele is a herniation of a peritoneal sac along the ventral wall of the rectum into the recto-genital space. The sac is filled most commonly with small bowel but also sometimes sigmoid colon (sigmoidocele) or omentum.

Enterocoels are difficult to detect on physical examination<sup>1-4</sup> and are therefore most commonly diagnosed radiologically. Dynamic MRI<sup>5-7</sup> and endovaginal ultrasonography<sup>8</sup> have both been used, although the diagnosis is most often made at defaecating proctography (DPG). The technique of DPG for detailing enteroceles has included vaginal coating, peritoneography<sup>9</sup> and small bowel opacification to further aid both grading and diagnosis<sup>10</sup>. Other pelvic floor diagnoses may also be made and it allows evaluation of anatomical and functional findings and may determine their contributions to the symptoms of obstructed defaecation for which the test is most commonly carried out. Whether an enterocele contributes to obstructed defaecation physically itself by 'pressing' on the rectum, or whether it is part of more widespread pelvic floor pathology and frequently associated with other more significant anatomical derangements has been open to debate<sup>9,11</sup>.

The primary aim was to evaluate the relationship between the presence of an enterocele and grades of rectal prolapse (on a severity spectrum from low-grade, through high-grade internal rectal prolapse, to external rectal prolapse). We also aimed to study the influence of sex, age, vaginal delivery and hysterectomy on presence of an enterocele.

## Method

The technique of DPG was standardised<sup>9</sup>. Small bowel was opacified with a 310ml mixture containing 100ml Baritop (Barium sulphate 94.6%w/w; Sanochemia Ltd., UK) and 10ml Gastrograffin (Schering Health Care Ltd., UK), ingested 30 minutes prior to the procedure. The rectum was prepared with 100ml of E-Z-Paste (Barium sulphate cream, 60% w/w; E-Z-EM, Canada), injected per anum using a 50ml bladder catheter tipped syringe. Lateral x-ray images were taken with the Siemens Sireskop SD image intensifier at 3 pulses/second, with the patient seated on a Perspex commode. Images were taken at rest, squeeze and evacuation (for at least 30 seconds).

The DPGs of consecutive patients to the Pelvic Floor Clinic between January 2004 and November 2008 were analysed. In this clinic DPG is carried out if patients have a full thickness rectal prolapse or suspicion thereof and in all patients with symptoms of constipation, obstructed defaecation (OD), resistant faecal incontinence (FI), mixed OD

and faecal incontinence, pelvic pain and/or discomfort. The extent of rectal prolapse was graded 1-5 using the Oxford Rectal Prolapse Grade (ORPG) (figure 2, table 1, page 12,13). Patients were included in the study if they had full thickness internal [grades 1-4 prolapse] or external rectal prolapse [grade 5 prolapse]. Invagination of the full thickness of the rectal wall was taken to be the case if the width of the intussusciens was greater than 3mm<sup>16</sup>. DPGs were analysed separately by three investigators with regards to the presence of an enterocoele and ORPG. Studies were excluded if defaecation was not achieved during the study, if the image quality was too poor to identify small bowel or if all investigators read the scan differently. This only occurred in a hand full of cases but was felt to be important with regards reproducibility of proctogram assessment.

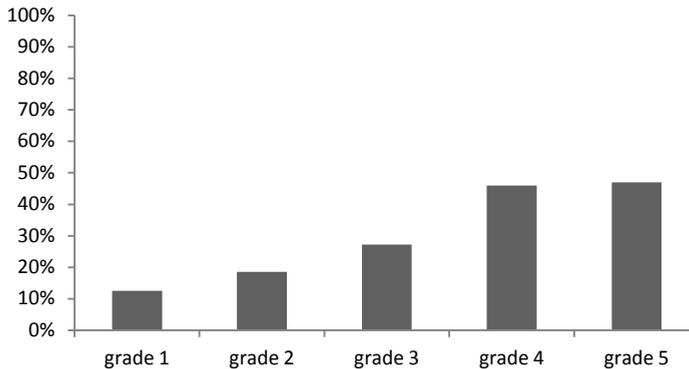
The patients' sex and age at presentation were documented. The obstetric history of female patients was documented; nullips and those with children born by Caesarean section only were classified in the 'no vaginal delivery' group (Vo) and those with one or more vaginal deliveries in the vaginal delivery group (V+). Hysterectomy status was also documented. Comparison primarily between rectal prolapse grade and the presence of an enterocoele was made. The presence of an enterocoele was evaluated with regards the age, sex and parity of patients and whether or not the patient had had a hysterectomy.

Statistical analysis was carried out using the JMP 7.0 statistical package (SAS Institute, North Carolina, USA). For categorical data, results were analysed in contingency table format, using the Chi-squared test. Parametric data was compared using a student t-test. A p-value <0.05 (2-sided) was considered significant.

## Results

### Enterocoele and rectal prolapse

During the period of the study 915 patients were seen in clinic and 680 of these had a defaecating proctogram. 371 patients (55%) were demonstrated to have grades 1 to 4 internal (IRP) or external rectal prolapse (ERP). Of these 322 (87%) were female and 49 male. The age distribution was shown to be parametric with a mean age of 57 years (s.d. 14.0). Of those with an enterocoele present, 1/8 (13%) had grade 1 IRP, 10/54 (19%) grade 2 IRP, 34/125 (27%) grade 3 IRP, 62/135 (46%) grade 4 IRP and 23/49 (47%) with grade 5 full thickness (Figure 2). There was a statistically significant correlation between the presence of an enterocoele and increasingly severe grade of rectal prolapse (Pearson X<sup>2</sup> test: p<0.0002).



**Figure 2**, Diagram comparing the presence of enterocele with grade of rectal prolapse.  
 X-axis: rectal prolapse grade.  
 Y-axis: percentage presence of enterocele.

### Enterocele and other factors

An enterocele was present in 125/322 women (39%) and 5/49 men (10%). The higher rate in women was statistically significant (Pearson's  $\chi^2$  test:  $p < 0.0001$ ). There was a higher likelihood of having an enterocele with advancing age. The mean age of those with an enterocele was significantly higher than in those without an enterocele (55.1 years (95% CI 53.3–56.8) versus 60.8 years (95% CI 58.4–63.2), Student t-test:  $p < 0.0001$ ).

Of the cohort of 322 women in the study, data on vaginal delivery were available in 303 (94%). Of these 247 (82%) had delivered vaginally (V+) and 56 (18%) had not (Vo). There was no significant difference in the proportion of V+ and Vo women with enteroceles (39% versus 38%, respectively, Pearson  $\chi^2$  test:  $p = 0.8$ ). Data on hysterectomy status were available in 292 (91%) of the study cohort of 322 women. Of these 184 (63%) had undergone hysterectomy and 108 (37%) had not. There was a significantly higher proportion of enteroceles in women who had undergone a hysterectomy (49% vs. 34%, Pearson  $\chi^2$  test:  $p = 0.015$ ).

## Discussion

Anatomical levels in the posterior pelvic compartment have been described<sup>13</sup> which help to explain how rectal intussusception, rectocele and enterocele may all be part of a rectal prolapse syndrome<sup>14</sup>. It has been previously shown that rectal prolapse (internal or external) is more common in those with enterocele<sup>9</sup>. In studies by Lapalus et al. and Mellgren et al. rectal intussusception was found in 52% and 55% and external rectal prolapse in 4% and 38% of cases of patients with enterocele<sup>15,16</sup>. However, because particularly internal rectal prolapse is rarely graded, the relationship of enterocele to

grade or degree of prolapse, has not been shown. This work supports the concept that enterocele is increasingly seen with advancing severity of rectal prolapse grade as seen on defaecating proctography. Enterocele is therefore a marker of severity of pelvic floor weakness.

It is interesting to note that 13% of grade I rectal prolapses had an enterocele in this study which is about the same as the figure of 10% of healthy female volunteers who have been shown to have an enterocele in other studies<sup>12,17</sup>. This suggests consistency with the published literature.

With regard to the levels of support in the posterior pelvic compartment women having had hysterectomies lose the pelvic visceral support of the uterosacral and cardinal ligaments (level I support)<sup>14</sup>. They were found to be more likely to have an enterocele than those who had not. This is supported by previous studies that have shown that up to two thirds of women with symptomatic enteroceles have undergone previous hysterectomy<sup>15,18-20</sup>. It was also noted that enterocele was more common with advancing age. This has also been demonstrated with regards to advancing grades of internal and external rectal prolapse. The lack of association found between enterocele and parity has been found to be the case in previous studies<sup>15</sup>.

There has been a debate as to symptoms caused directly by an enterocele and those associated with it as a result of other simultaneous / concomitant pathologies. An association has been drawn between enterocele and obstructed defaecation<sup>18,21-23</sup> and also with symptoms of pelvic discomfort, pelvic heaviness and pressure and feelings of prolapse<sup>24-25</sup>. Chou et al.<sup>26</sup> compared signs and symptoms in females with and without enteroceles and concluded that there were no significant differences related to bowel function and indeed Halligan et al.<sup>9</sup> concluded that patients with enterocele evacuated more rapidly.

Surgical approaches aimed purely at correcting the enterocele at the pelvic inlet, such as that described by Gosselink et al.<sup>24</sup>, result in improvement in symptoms in only 25% of patients. Symptoms of pelvic discomfort and pressure, attributable to the enterocele itself have been shown to improve, but obstructed defaecation symptoms persisted in all patients. Oom et al.<sup>27</sup>, Mellgren et al.<sup>28</sup> and Jean et al.<sup>25</sup> have shown persisting symptoms of obstructed defaecation in 75%, 80% and 85% of patients respectively. This suggests that other associated pathology is responsible for these residual symptoms, and argues against enterocele being a major cause of obstructed defaecation. It suggests that enterocele is associated with other symptom-generating, advanced pelvic floor pathology.

## Conclusion

Enterocoele is increasingly seen with advancing severity of rectal prolapse grade. This suggests that the two findings are part of the same pathological pelvic floor process. These data support the hypothesis that enterocoele is a marker of severe pelvic floor weakness. Enterocoele is seen more frequently in females particularly after hysterectomy.

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**Excellent response rate of anismus to botulinum toxin if rectal prolapse misdiagnosed as anismus, pseudoanismus, is excluded**

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# Abstract

**Background:** Anismus causes obstructed defaecation as a result of inappropriate contraction of the puborectalis/external sphincter. Proctographic failure to empty after 30 s is used as a simple surrogate for simultaneous electromyography/proctography. Botulinum toxin is theoretically attractive but efficacy is variable. We aimed to evaluate the efficacy of botulinum toxin to treat obstructed defaecation caused by anismus.

**Method:** Botulinum toxin was administered, under local anaesthetic, into the puborectalis/external sphincter of patients with proctographic anismus. Responders (resolution followed by recurrence of obstructed defaecation over a 1- to 2-month period) underwent repeat injection. Nonresponders underwent rectal examination under anaesthetic (EUA). EUA-diagnosed rectal prolapse was graded using the Oxford Prolapse Grade 1–5.

**Results:** Fifty-six patients were treated with botulinum toxin. Twenty-two (39%) responded initially and 21/22 (95%) underwent repeat treatment. At a median follow up of 19.2 (range, 7.0–30.4) months, 20/21 (95%) had a sustained response and required no further treatment. Isolated obstructed defaecation symptoms (OR = 7.8, P = 0.008), but not proctographic or physiological factors, predicted response on logistic regression analysis. In 33 (97%) of 34 nonresponders, significant abnormalities were demonstrated at EUA: 31 (94%) had a grade 3–5 rectal prolapse, one had internal anal sphincter myopathy and one had a fissure. Exclusion of these alternative diagnoses revised the initial response rate to 96%.

**Conclusion:** Simple proctographic criteria over diagnose anismus and under diagnose rectal prolapse. This explains the published variable response to botulinum toxin. Failure to respond should prompt EUA seeking undiagnosed rectal prolapse. A response to an initial dose of botulinum toxin might be considered a more reliable diagnosis of anismus than proctography.

# Introduction

Inappropriate contraction of the pelvic floor was described in the surgical literature as early as 1964, but it was Preson and Lennard-Jones who coined the phrase ‘anismus’ in 1985<sup>1,2</sup>. It is best described as a functional disorder of evacuation caused by failed relaxation and / or inappropriate contraction of the striated external anal sphincter muscle during attempted evacuation. It typically results in outlet obstruction-type chronic constipation. It has been variously named spastic pelvic floor syndrome, dyssynergia or puborectalis syndrome<sup>3</sup>. The incidence of anismus in the general population is unknown, but it has been reported, in a chronic constipation series, to range from 20% to 70%. Although the demographics are not completely understood, it is more common in women and in young or middle-aged individuals<sup>4-6</sup>.

The wide variation in incidence in reported constipation series attests to the difficulty in agreement of firm diagnostic criteria. Initially, diagnosis hinged on the balloon expulsion test and electromyographic demonstration of inappropriate recruitment of striated pelvic floor muscle during attempts at evacuation<sup>7,8</sup>. More recently, the Rome III criteria have refined the definition and diagnostic criteria for anismus<sup>9</sup>. In practice, the more simple and practical criteria of nonemptying of barium paste on proctography at 30 s, as described by Halligan et al.<sup>10</sup>, has come to be used as a surrogate marker for the more complex and impractical gold standard laboratory diagnosis of anismus.

Treatment has generally been in the form of either botulinum toxin injection or biofeedback, the rationale being to relax or retrain the pathophysiological striated puborectalis/external sphincter muscles. Biofeedback has been effective in anismus but is expensive, labour-intensive and time-consuming. Despite its theoretical attractiveness, the success rate of botulinum toxin for the treatment of anismus has been variable and often disappointing, and the reason for this has been unclear<sup>8,11-14</sup>. Possible explanations are variable anismus diagnostic criteria across reported botulinum toxin series, inadequate dosing, variable injection sites and a high and variable placebo rate. In this study, the results of treatment of anismus with botulinum toxin injection were reviewed in an attempt to seek an explanation for failures of this treatment.

## Method

Since 2005, all patients referred to a tertiary pelvic floor clinic have been prospectively entered into a dedicated database. All patients with a history and examination consistent with outlet obstruction constipation were assessed by defecating proctography and transit studies, anorectal physiology and anal ultrasound.

Anorectal manometry was performed in the left lateral position using a water-perfused nine-lumen vector manometry catheter with a 3.9-mm external diameter (MED 2280; Mediplus, High Wycombe, UK), and data were acquired using an eight-channel transducer (PIP-4-8SS; Mui Scientific, Mississauga, Canada). Pressure was expressed in mmHg, and normal ranges were defined for a maximum resting pressure of 45–85 mmHg and a maximum squeeze increment of > 60 mmHg. Anal ultrasound was performed using a 10-MHz radial transducer (B&K Medical, Naerum, Denmark).

Proctography was performed according to a well-defined local protocol. A 310-ml mixture of 100 ml of barium sulphate paste (Baritop, Barium Sulphate 94.6% w/w; Sanochemia Ltd, Bristol, UK) and 10 ml of contrast (Gastrograffin; Schering Health Care Ltd, Burgess Hill, UK) was ingested orally 30 min before the procedure to opacify the small bowel. Immediately before the procedure with the patient in the left lateral position, 100 ml of barium paste (Barium Sulphate cream, 60% w/w; E-Z-EM, Anjou, Canada) was injected per anum into the rectum using a 50-ml bladder syringe.

The patient was then seated on a perspex commode. Lateral X-rays were taken with a Siemens Sireskop SD image intensifier (Siemens AG, Forchheim, Germany) at 3 pulses/s, with the patient at rest, during squeeze and during evacuation for 30 s. Proctograms were performed and reported by a radiologist with an interest in pelvic floor imaging. Images were reviewed by a colorectal surgeon. Transit studies were performed using a single X-ray radio-opaque marker technique.

The proctographic diagnostic criterion for anismus was nonemptying of barium after 30s. Proctographic criteria used to compare those responding or not to botulinum toxin included pelvic floor descent (in mm, measured by the furthest caudal travel of the anorectal junction during defaecation attempts), the proportion of patients whose anorectal angle became more acute (narrowing) rather than more obtuse, and the proportion of patients with zero emptying of barium at 30 s.

From January 2008, patients with proctographic evidence of anismus were offered botulinum toxin injection under local anaesthetic using the following protocol. Anal blockade was performed, with the patient in the left lateral position, using a mixture of 20 ml of 0.5% marcaine and 10 ml of 1% lignocaine injected immediately lateral to the outer border of the external sphincter at 3 o'clock and at 9 o'clock. A 21-gauge needle

was directed posteriorly, medially and cranially, and anaesthetic was injected into the ischiorectal space to anaesthetize the perineal branches of the pudendal nerve.

Either 100 U of botulinum toxin (Botox; Allergan, Irvine, California, USA) or 500 U (equivalent dose) of Dysport (Ipsen Ltd, Slough, UK) was diluted in 2 ml of normal saline and a 21-gauge needle was passed cranially through the external sphincter to the level of the puborectalis muscle. The needle was then gradually withdrawn, injecting small amounts of the mixture along the length of the puborectalis/external sphincter muscle. One millilitre was given bilaterally at 3 o'clock and at 9 o'clock.

Patients were assessed as an outpatient at 6 and 12 weeks. The occurrence of a temporary symptom response (onset of effect 2–3 days, offset 6–8 weeks) was noted. Patients who showed a characteristic positive initial response were offered repeated treatment using the same dose and technique when it was clear that they had developed recurrent obstructive defaecation syndrome.

In patients who failed to have a positive initial response, an examination under anaesthetic (EUA) was performed using a circular anal dilator device (Frankenman International Ltd, Hong Kong, China) to identify any other causes for symptoms. Any demonstrable rectal prolapse was graded using the Oxford Rectal Prolapse Grading system, as previously described<sup>15</sup>. This grades rectal prolapse as low-grade internal rectal prolapse (grade 1 or grade 2; recto–rectal intussusception), high-grade internal rectal prolapse (grade 3 or grade 4; recto–anal intussusception) or external rectal prolapse (grade 5) (figure 2, table 1, page 12,13).

Data analysis was performed using the Statistical Software Package version 15.0 (SPSS Inc., Chicago, Illinois, USA). Categorical variables were compared using the  $\chi^2$  test, while the Student's *t*-test was used for continuous data with a normal distribution. Binary logistic regression analysis was used to identify factors predictive for good response. The Cox proportional hazard model was used to examine predictive factors in a multivariate analysis and to exclude possible confounding factors. From a statistical point of view, the limited number of events meant that only a restricted number of possible confounders could be examined; therefore, the preoperative presenting symptom with multiple categories (obstructive defaecation, mixed symptoms, obstructive defaecation + pain, etc.) was recoded into a dichotomous variable by comparing obstructive defaecation with all other presenting symptoms<sup>16</sup>.  $P \leq 0.05$  was considered statistically significant.

# Results

## Clinicopathological characteristics

A diagnosis of anismus was made in 56 (19%) of 295 proctograms undertaken for obstructed defaecation and all of these patients completed the treatment protocol. The mean ( $\pm$  SD) age was 47.5 ( $\pm$  15.1) years and 64% of patients were female (Table 1). Thirty-seven (66%) patients presented with symptoms of obstructed defaecation alone, nine (16%) with perineal pain with (six patients) or without (three patients) obstructed defaecation, seven (13%) with mixed obstructed defaecation and faecal incontinence, two (4%) with solitary rectal ulcer and obstructed defaecation, and one (2%) with slow transit constipation.

Forty-two (75%) patients underwent anorectal physiology. The mean  $\pm$  SD maximum resting pressure was ( $\pm$ 39.7) mmHg and the mean  $\pm$  SD maximum squeeze increment (MSI) was 69  $\pm$  65.5 mmHg. Thirty-one patients underwent additional anal ultrasounds and all were demonstrated to have an intact internal and external anal sphincter. However, six patients had a thickened internal anal sphincter, four had thickened submucosa and seven were demonstrated to have a thinned internal anal sphincter.

| Characteristics              |                 |
|------------------------------|-----------------|
| Age (years)                  | 47,5 (+/-15,1)  |
| Sex ratio (F:M)              | 36:20 (64%/36%) |
| Presenting symptoms          |                 |
| OD                           | 37 (66%)        |
| OD + pain                    | 6 (11%)         |
| OD + FI                      | 7 (13%)         |
| OD + SRU                     | 2 (4%)          |
| Pain                         | 3 (6%)          |
| STC                          | 1 (2%)          |
| Anorectal physiology (42/56) |                 |
| MRP (mmHg)                   | 58,9 (+/-39,7)  |
| MSI (mmHg)                   | 69,0 (+/-65,5)  |

**Table 1,** Clinicopathologic characteristics of the patients.

Data are given as mean (SD) or n (%), unless stated otherwise. F;female,M;male, MRP, maximum resting pressure; MSI, maximum squeeze increment; OD, obstructed defaecation.

## Treatment outcome

An initial response to botulinum toxin occurred in 22 (39%) of the 56 patients with a characteristic temporary botulinum toxin dose–response pattern, resulting in resolution of obstructed defaecation symptoms. In these patients a re-response occurred in 21 (95%) of the 22 initial responders after repeat injection, with resolution of symptoms. At a median follow up of 19.2 (range, 7.0–30.4) months, 20 (95%) of 21 patients had a sustained response and required no further treatment. One patient relapsed at 12 months.

| Predictive factors   | Botuline toxin response |                | P     |
|----------------------|-------------------------|----------------|-------|
|                      | Positive                | Negative       |       |
| Gender               |                         |                |       |
| Female               | 11/36 (31%)             | 25/36 (70%)    | 0.07* |
| Male                 | 11/20 (55%)             | 9/20 (45%)     |       |
| Presenting symptom   |                         |                |       |
| OD                   | 19/37 (51%)             | 18/37 (49%)    | 0.01* |
| Not OD alone         | 3/19 (16%)              | 16/19 (84%)    |       |
| Anorectal physiology |                         |                |       |
| MRP (mmHg)           | 60,7 (+/-44,5)          | 57,8 (+/-36,9) | 0.8§  |
| MSI (mmHg)           | 77,9 (+/-78,2)          | 63,5 (+/-56,3) | 0.4§  |

**Table 2,** Predictive factors of good botox response.

Data are given as mean  $\pm$  SD or as n positive/total (%). MRP, maximum resting pressure; MSI, maximum squeeze increment; OD, obstructed defaecation. \* Chi-square test; § student's t-test.

### Factors predictive of initial response

Logistic regression analysis demonstrated that gender was of borderline significance in predicting a response, with 55% of men responding compared with 31% of women ( $P = 0.07$ ) (Table 2). A similar difference was also found for patients presenting with obstructed defaecation alone compared with all other presenting symptoms ( $P = 0.01$ ). Multivariate analysis showed that obstructed defaecation, gender and symptoms were independent prognostic variables (OR = 7.8; 95% CI: 0.028–0.587;  $P = 0.008$ ). Neither maximum resting pressure nor maximum squeeze pressure was found to have any relationship with response. Proctograms were reviewed retrospectively, in light of which patients had responded to botulinum toxin, to determine the predictability for response of various proctographic criteria, in addition to those of Halligan et al. None was predictive of a response to botulinum.

### EUA findings in non-responders

Thirty-three (97%) of 34 initial nonresponders had a treatable other condition, including 31 (94%) with advanced (grade 3–5) rectal prolapse, one with biopsy proven internal anal sphincter myopathy and one with a fissure. Patients with advanced rectal prolapse included one with an external rectal prolapse and 30 with a high-grade internal rectal prolapse (11 were Oxford Prolapse Grade 3 and 19 were Oxford Prolapse Grade 4). EUA was normal in one patient. Excluding the 33 patients with other pathology, the success rate of botulinum was 23 (96%) of 24 patients.

### Botulinum toxin side effects

Transient (1 or 2 weeks) minor faecal incontinence, usually to flatus, or minor soiling, occurred in four of 16 patients who ultimately had the alternative diagnosis of prolapse. No patient with either an initial or a subsequent response to botulinum toxin, with resolution of obstructed defaecation symptoms, experienced a continence disturbance.

## Discussion

The results show that in patients with anismus diagnosed on simple proctographic criteria, the response rate for botulinum toxin injection is modest, in keeping with the published literature. The wide published variation in response has been puzzling because although variable doses have been used, the technique is simple and standardisable. Possible reasons for the variation include immunoresistance to botulinum toxin, variability in the amount of active drug present in a single vial, the susceptibility of cholinergic cells and the ability of these cells to bind and internalize the toxin and the presence of an appropriate intracellular target<sup>13</sup>. However, no previous report on the efficacy of botulinum toxin injection has questioned the actual accuracy of the diagnoses of anismus.

We found that of the patients who failed to respond to treatment with botulinum toxin, almost all had an alternative diagnosis (usually advanced rectal prolapse) not shown on proctography but seen during EUA. If these patients are excluded, which seems reasonable as prolapse would not normally be treated by botulinum toxin, the response rate rises to over 90%. These findings could explain the variable response published in the literature. There was no obvious difference in the response rates according to findings on dynamic proctography or anorectal physiology. However, the response rate was significantly higher in patients with obstructed defaecation as a sole presentation, and tended also to be higher in the male population.

Anismus is probably a specific disorder of striated muscle function. It has a urological equivalent – Fowler’s syndrome – where demonstrable striated external urethral sphincter muscle dysfunction results in obstructed micturition. Therefore, it is unlikely that prolapse and true anismus commonly co-exist because the pathophysiology of each is likely to be completely different. This observation has major ramifications because about 20% of proctograms undertaken for obstructed defaecation show anismus. If this indicates an over diagnosis of anismus, it also means an under diagnosis of prolapse. This may lead to inappropriate caution in treating prolapse in patients with an initial proctogram showing anismus for fear of exacerbating the functional disorder by anti-prolapse surgery.

The diagnosis of anismus has been reported to require simultaneous electromyography and defecating proctography, with measurement of intra-rectal pressure to rule out inadequate defaecatory propulsion<sup>7,17</sup>. However, in practice these tests are rarely available. In 1995, Halligan et al. produced simple proctographic diagnostic criteria for anismus that could replace and act as a surrogate for simultaneous electromyography and defecating proctography. These criteria have been widely adopted by many units. Interestingly, however, 15% of the patients with anismus in the publication of Halligan et al. also had a high-grade internal rectal prolapse compared with none of the controls. It

should also be noted that incomplete evacuation on proctography was not entirely sensitive or specific for anismus<sup>10</sup>.

There has been difficulty in defining a gold standard for the diagnosis of anismus. Although electromyography of the puborectalis and external sphincter is thought to be sensitive and specific, it has been suggested that this is, in fact, artifactual, as ambulatory measurements do not reflect those found in the laboratory<sup>18</sup>. Anal pressures on straining and defecography have been used, alone or in combination with electromyography, but there is poor correlation between these tests, and widely heterogeneous groups have been used in studies to date<sup>19,20</sup>. It is not surprising therefore that certain commentators have even doubted the existence of anismus as a clinical entity.

| Author                             | N  | Response   | Dose*   | Repeated | Follow-up (months) |
|------------------------------------|----|--|---------|----------|--------------------|
| Hallan <i>et al.</i> <sup>8</sup>  | 7  | 57% improved   | 3 ng    | no       | 12                 |
| Joo <i>et al.</i> <sup>11</sup>    | 4  | 50% improved   | 12 U    | no       | 12                 |
| Maria <i>et al.</i> <sup>12</sup>  | 4  | 100% improved ST<br>75% improved LT                      | 30 U    | yes      | 24                 |
| Ron <i>et al.</i> <sup>14</sup>    | 25 | 38% improved   | 30 U    | yes      | 6                  |
| Maria <i>et al.</i> <sup>13</sup>  | 24 | 71% improved   | 60 U    | yes      | 39                 |
| This study                         | 56 | 39% improved ST<br>96% improved ST***<br>95% improved LT | 500 U** | yes      | 19                 |
| Shafik <i>et al.</i> <sup>35</sup> | 15 | 86% improved ST<br>86% improved LT                       | 25 U    | yes      | 15                 |
| Farid <i>et al.</i> <sup>36</sup>  | 24 | 71% improved ST<br>33% improved LT                       | 100 U   | no       | 12                 |

**Table 3,** Published results of botulinum toxin in anismus.

LT, long term; ST, short term.

\*Botox (Allergan) unless otherwise stated.

\*\*Dysport (Ipsen).

\*\*\*Revised initial response rate.

It is clear, however, is that a therapeutic response to treatment with botulinum toxin, especially in a typical time course (onset in 2-3 days end in 6-8 weeks), confirms the diagnosis of anismus<sup>8,11-14,21-34</sup>. Since 1998 when it was first used for anismus, several studies have reported on the efficacy of botulinum toxin injection with success rates varying from 33% to 86% (Table 3).

There are several limitations to this study. It is purely observational and the patient numbers are quite small. However to date, this is the largest series of patients treated with botulinum for suspected anismus. It could be argued that as a tertiary referral centre the population of patients with outlet obstruction does not reflect general colorectal practice. Furthermore EUA has never been undertaken in patients responding to botulinum and it is possible that it would also reveal prolapse in some of these

patients. As there was no placebo control in this observational study, it is possible that the responses to botulinum toxin represent a placebo effect, although the pattern of response and re-response would argue against this.

We propose the following management algorithm for anismus. A diagnostic dose is given initially and its effects wear off after 6–8 weeks. Nonresponders do not have true anismus and almost certainly have another underlying condition, which EUA of the rectum should reveal. A positive initial response establishes a firm diagnosis of anismus and will lead to a longer-term clinical benefit with a repeat or therapeutic treatment using the same dose.

## **Conclusion**

We suggest that simple surrogate proctographic criteria results in the over diagnosis of anismus. There are other reasons for failure to empty in 30 s, chiefly advanced rectal prolapse. The proctographic over diagnosis of anismus explains the variable published response to botulinum toxin (as a result of failure in prolapse) and leads to the under diagnosis of prolapse, which is best disclosed at EUA with a circular anal dilator device. We suggest that a response to an initial diagnostic dose of botulinum toxin should be regarded as a more reliable diagnosis of anismus than proctography and can be used as a screening tool rather than as a diagnostic tool for anismus.

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## **Laparoscopic ventral rectopexy for internal rectal prolapse: short-term functional results**

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# Abstract

**Objective:** Over the last 15 years, posterior rectopexy, which causes rectal autonomic denervation, was discredited for internal rectal prolapse because of poor results. The condition became medical, managed largely by biofeedback. We aimed to audit the short-term functional results of autonomic nerve-sparing laparoscopic ventral rectopexy (LVR) for internal rectal prolapse.

**Method:** Prospectively collected data on LVR for internal rectal prolapse were analysed. End-points were changes in bowel function (Wexner Constipation Score and Faecal Incontinence Severity Index) at 3 and 12 months. Analysis was performed using Mann-Whitney U-test for unpaired data and Wilcoxon signed rank test for paired data (two-sided p-test). Functional outcomes were compared with those achieved previously for external rectal prolapse (ERP).

**Results:** Seventy-five patients underwent LVR (median age 58, range 25–88 years, median follow up was 12 months). Mortality (0%), major (0%) and minor morbidity (4%) were acceptably low. Median length of stay was 2 days. Preoperative constipation (median Wexner score 12) and faecal incontinence (median FISl score 28) improved significantly at 3 months (Wexner 4, FISl 8, both  $P < 0.0001$ ) and 12 months (Wexner 5, FISl 8, both  $P < 0.0001$ ). No patient had worse function. Functional outcomes were similar to those for ERP.

**Conclusion:** Laparoscopic ventral rectopexy for internal rectal prolapse improves symptoms of obstructed defaecation and faecal incontinence in the short-term. This establishes proof of concept for a nerve-sparing surgical treatment for internal rectal prolapse.

## Introduction

Surgical interventions for internal rectal prolapse (IRP) (Fig. 1), occult rectal prolapse or rectal intussusception, have been reported for over 50 years. During the 1990s, however, several publications cast doubt upon the wisdom of a surgical solution<sup>1-3</sup>. Treated by traditional posterior rectopexy, patients with IRP experienced poor results. There was little improvement, and in many cases, worsening of the very symptoms that the procedure was aiming to relieve, namely obstructed defaecation (OD) and faecal incontinence (FI). Addition of sigmoid resection mitigated these poor results to a degree, but at the expense of the potential risks of an anastomosis for benign disease.

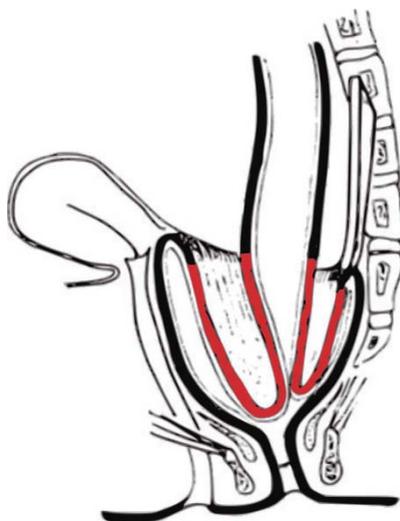


Figure 1, Internal rectal prolapse.

More recently, there has been a re-evaluation of surgery for IRP. This has been partly driven by the emergence of new technologies such as minimally invasive and endo-anal surgery. Laparoscopic ventral rectopexy (LVR) has proven safe and effective for external rectal prolapse (ERP)<sup>4</sup>. This procedure is durable, minimally invasive, autonomic nerve-sparing and does not require colonic resection. Functional results have been excellent. At the same time, the Stapled Transanal Rectal Resection (STARR) procedure has been developed in Italy and offered the pelvic floor surgeon another surgical option<sup>5-7</sup>.

Encouraged by our and others' functional results of LVR for ERP<sup>8</sup>, and predicated on our hypothesis of IRP as part of a continuous spectrum of rectal prolapse whose extreme end is ERP, with a shared common pathophysiology, the same operation was undertaken in carefully selected patients with symptomatic IRP (OD with or without FI) and prospectively audited. The primary aim was to evaluate short-term functional outcomes after LVR for IRP. The secondary aim was to compare functional comes (OD and FI) in IRP and ERP to explore the pathophysiological relationship between IRP and EPR.

## Method

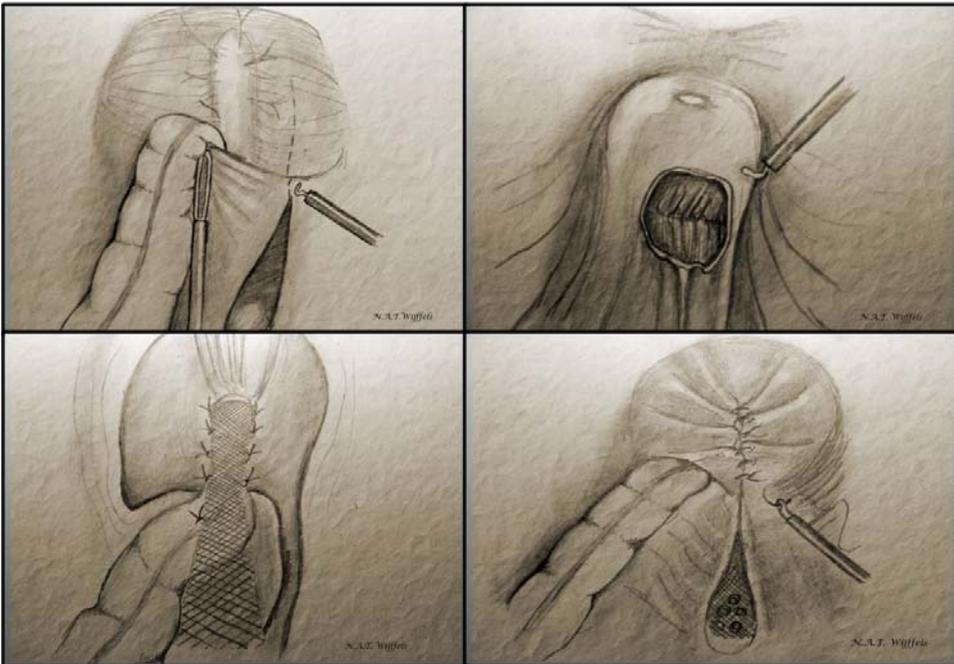
Data for all patients who underwent LVR for IRP from August 2005 to December 2007 were prospectively entered into a pelvic floor database. Diagnosis of IRP was suggested on history of symptoms of OD and / or FI and clinical examination and confirmed radiologically. A functional inventory of OD and FI symptoms was documented using the Wexner Constipation Score<sup>9</sup> and the Faecal Incontinence Severity Index (FISI)<sup>10</sup> questionnaires. All patients underwent an endoscopic evaluation of the bowel, either flexible sigmoidoscopy or colonoscopy.

The diagnosis of IRP was established at defecating proctography, using a standard method previously described at our institution<sup>11</sup>. Proctograms were evaluated using the Oxford Grading System for Rectal Prolapse (figure 2, table 1, page 12,13)<sup>12</sup>. Briefly, IRP was graded as I or II (high and low recto-rectal) and III and IV (high and low recto-anal). On a selective basis, patients with borderline proctographic grade (grade II vs. III) underwent examination under anaesthesia, where the same grading system was applied. All patients underwent a colonic transit study, using the French technique<sup>13</sup>. In the presence of significant IRP, colonic slow transit was considered a relative contraindication to surgery. All patients were discussed in a multidisciplinary colorectal pelvic floor meeting and all proctography reviewed in a radiological case conference. All patients also underwent anorectal physiology and endo-anal ultrasound to exclude other causes of OD. Our techniques and equipment have previously been described<sup>12</sup>. Briefly, this comprised anal manometric assessment of resting and squeeze pressures, rectal balloon distension thresholds and recto-anal inhibitory reflex.

Patients were selected for surgery using the following criteria: those with a symptomatic grade III-IV (recto-anal) IRP with significantly severe symptoms of OD, with or without FI, who had failed standard medical management with laxatives and fiber supplementation. Most patients had also undergone and failed biofeedback therapy.

### Operative technique

The operative technique of LVR is that described by D'Hoore and Penninckx<sup>4</sup>, and has been described in our previous study on ERP<sup>5</sup>. The procedure was performed in exactly the same way for IRP, by two of the authors (CC and IL, Fig. 2). Dissection was conducted exclusively anterior to the rectum, preserving the lateral ligaments, and polypropylene mesh was used for rectal fixation. Written informed consent was obtained. All patients wore anti-embolic stockings and a sequential calf compression device was used intra-operatively. All received a single intravenous dose of Amoxicillin/Clavulanic acid (or Cephalosporin if penicillin-allergic) and Metronidazole at induction.



**Figure 2,** Operative technique.

*Left upper corner; Paramesorectal peritoneal incision, Right upper corner; Rectovaginal plane dissection, Left lower corner; Ventral Recto(colpo)pexy, Right lower corner; High closure pelvic peritoneum with repair peritoneocele.*

Postoperatively opiates and epidural infusions were avoided, and analgesia was provided with regular paracetamol and nonsteroidal anti-inflammatories. An enhanced recovery programme was used, with early mobilization and resumption of normal diet (the day of surgery) and removal of urethral catheter and IV fluids on day 1. Patients were counselled preoperatively that the length of stay would be 1–2 postoperative nights. Patients were commenced on Movicol three times daily on day 1 postoperatively and this was weaned after discharge over a period of 4–6 weeks.

### **Follow up**

All patients were reviewed in the outpatient clinic at 3 and 12 months postoperatively and assessed for recurrence and morbidity. Constipation and FISl questionnaires were also repeated at those visits.

### **Statistical analysis**

Quantitative data were expressed as median and range. OD was considered a Wexner score of >5. Significant improvement in OD or FI was considered as a reduction in Wexner or FISl score of at least 25%. Analysis was performed using Mann–Whitney U-test for unpaired data and Wilcoxon signed rank test for paired data (two-sided p-test).

# Results

## Patient demographics and follow up

Seventy-five patients (69 female, 92%) had undergone for LVR for symptomatic IRP from August 2005 to December 2007. Forty-nine patients (65%) had mixed OD and FI, 16 OD alone and 10 FI alone. The median age was 58 years, and range 25–88 years. Median follow up was 12 months (range 3–48 months).

## Conversions and length of stay

One patient with IRP had dense pelvic adhesions from previous pelvic surgery not allowing access to the sacral promontory. LVR was abandoned in favour of a perineal procedure (STARR). Median length of stay was 2.0 days (range 2–6 days).

## Recurrence

Four patients (5%) had recurrent IRP as demonstrated at postoperative proctography, with symptomatic relapse within 6 months following initial functional improvement. All underwent diagnostic laparoscopy and reattachment of the anterior rectum to the mesh. Two patients of these patients experienced improved postoperative function, and two others derived no benefit.

| Internal prolapse (n = 75) |   |
|----------------------------|---|
| Minor                      | 3 (4%)<br>1 pelvic haematoma<br>1 urine tract infection<br>1 readmission for pain |
| Major                      | 0 (0%)  |

Table 2, Complications.

## Morbidity and mortality

There was no postoperative mortality or major morbidity. Minor morbidity occurred in three patients (4%) (Table 2). There were no mesh-related complications. No female patients complained of sexual dysfunction and no male patient complained of ejaculatory or erectile difficulties postoperatively, although this was not a specific end-point of this study.

## Obstructed defaecation

Of 75 patients with IRP, 65 complained of OD preoperatively, 49 with mixed OD/FI, and 12 pure OD. At 3 months postoperative, 56 (86%) of these patients had improved OD and 9 (14%) persistent OD. Of the 56 improved, 33 (59%) were cured and 23 (41%) were better. No patient experienced worsening or new-onset of OD. At 3 months the Wexner constipation score was significantly reduced (median preop 12 vs. 4,  $P < 0.0001$ , Table 3).

There was a non-significant trend to better improvement of OD in patients with mixed OD / FI compared with pure OD (90% vs. 75%, 95% CI difference - 10.9 to 41.9). At 12 months the Wexner constipation score remained significantly reduced (median preop 12 vs. 5,  $P < 0.0001$ ).

|                                    | Preoperative | Postoperative<br>3 Months | Postoperative<br>12 Months |
|------------------------------------|--------------|---------------------------|----------------------------|
| Wexner constipation score (median) |              |                           |                            |
| Internal prolapse                  | 12           | 4*                        | 5*                         |
| External prolapse                  | 9            | 4*                        | 4*                         |
| FISI score (median)                |              |                           |                            |
| Internal prolapse                  | 28           | 8*                        | 8*                         |
| External prolapse                  | 37           | 2*                        | 8*                         |

**Table 3,** Bowel function scores.

\* $P < 0.0001$  versus preoperative.

### Faecal incontinence

Of 75 patients with IRP, 59 (79%) complained of FI preoperatively, 49 with mixed FI/OD, and 10 pure FI. At 3 months postoperative, 50 patients (85%) had improved FI and 5 (15%) persistent FI. Of the 50 improved, 24 (48%) were cured and 26 (52%) were better. No patient experienced worsening or new-onset of FI. At 3 months the FISI score was significantly reduced (median preop 28 vs. 8,  $P < 0.0001$ , Table 3). There was a non-significant trend to better improvement of FI in patients with mixed FI/OD compared with pure FI (90% vs. 60%, 95% CI difference - 1.5 to 61.5). At 12 months the FISI incontinence score remained significantly reduced (median preop 28 vs. 8,  $P < 0.0001$ ).

### External rectal prolapse

Our results for ERP have been previously published<sup>5</sup>. The details of this somewhat larger cohort of ERP patients in this study were as follows: Eighty-five patients (79 female, 93%) underwent LVR for ERP (age median 73 years and range 16–93 years). Median follow up was 29 months. Mortality (0%) and morbidity (11%) were acceptable.

At 3 months, there was no significant difference between OD improvement (Wexner score) for ERP (median preop 9 vs. 4,  $P < 0.0001$ ) and IRP (median preop 12 vs. 4,  $P < 0.0001$ ) (Table 3). The similarity in OD improvement was maintained at 12 months for ERP (median preop 9 vs. 4,  $P < 0.0001$ ) and IRP (median preop 12 vs. 5,  $P < 0.0001$ ).

At 3 months, there was no significant difference between FI improvement (FISI) for ERP (median preop 37 to median 3-month postop 2,  $P < 0.0001$ ) and IRP (median preop 28 to median 3-month postop 8,  $P < 0.0001$ ) (Table 3). The similarity in FI improvement was maintained at 12 months for ERP (median preop 37 to 8,  $P < 0.0001$ ) and IRP (median preop 28 to 8,  $P < 0.0001$ ).

## Discussion

Over the last 15 years, a body of evidence that had, not unreasonably, discouraged a surgical remedy for IRP has accumulated. Many regard IRP as a variant of normal, a common incidental finding in asymptomatic patients.

The results of posterior rectopexy for IRP have been poor, constipation in many patients failing to improve or indeed worsening<sup>2</sup>. Doubts have also been raised about the relationship of IRP to ERP and a possible shared common pathophysiology. Consequently, there has been in effect a moratorium on rectopexy surgery for IRP, which has become a medical condition, whose only appropriate management has become biofeedback. Understandable then, but perhaps inappropriate now, surgery for IRP still remains controversial.

Several proctographic studies in the 1980's and 1990's were influential in dissuading surgeons from IRP surgery. Shorvon et al. suggested that IRP was a common incidental finding, existing in up to 50% of asymptomatic normal individuals<sup>14</sup>. Mellgren et al.<sup>15</sup> compared sequential proctograms (mean time interval 5.6 years) and only one patient developed ERP. Ihre et al.<sup>16</sup> reported fifty subjects with IRP, none of whom went on to develop ERP. These studies reinforced the idea that the natural history of IRP did not lead to ERP and that the two conditions did not share a common pathophysiology.

At the same time, the functional outcomes of classical posterior rectopexy for IRP were unacceptably poor. Randomized studies in ERP had clearly demonstrated that posterior rectal dissection induced a hindgut neuropathy and rectal denervation inertia<sup>17-19</sup>. Patients with IRP complaining of OD were unlikely to benefit from this approach. Resection-rectopexy might mitigate this new dysfunction but at the risk of an anastomosis. Posterior rectopexy and IRP surgery fell into disrepute and IRP became a medically treated condition.

More recently, established radiological assumptions have been re-visited and overturned. Dvorkin et al. recently showed that symptomatic IRP is morphologically more advanced than that found in asymptomatic subjects<sup>20</sup>, with significantly greater rectal wall thickness and greater descent into the anal canal than observed in asymptomatic patients. In Mellgren's series of 37 patients, 10 were lost to follow up because of death or relocation and seven patients underwent surgery for IRP. One could argue that patients who underwent surgery had a more symptomatic, higher grade of IRP, therefore biasing the group left for follow up. In the study by Ihre, the follow-up period is unclear, given only as range of '2 to 13 years'.

Other less quoted studies had demonstrated a clear relationship between IRP and ERP. Broden et al. reported a defaecographic study of ERP and IRP<sup>21</sup>. Using radiological clips, they confirmed invagination of the anterior rectal wall 6–8 cm above the anal verge in both ERP and IRP. They noted the similarity of symptoms between the two groups, and reported the progression to ERP in two of their patients. Sun et al. reported anorectal physiological similarities in ERP, solitary rectal ulcer syndrome and anterior rectal mucosal prolapse with a two decade age-difference between mucosal prolapse and ERP patients<sup>22</sup>. Our group has published data supporting a natural history of slow, age-related progression through various grades of IRP to ERP using a prolapse grading system<sup>23</sup>.

At the same time, surgery has become more functionally sophisticated. There is growing interest in the novel autonomic nerve-sparing LVR, as a result of both impressive functional results in ERP<sup>4</sup> and the advantages of a laparoscopic approach. Because it avoids posterior rectal mobilization and thus rectal denervation inertia, it improves OD symptoms in about 80% of patients with ERP without worsening or inducing new onset constipation symptoms, and these functional results appear to be reproducible<sup>8,24</sup>. This is in distinct contrast to traditional posterior rectopexy for ERP, after which about 50% of patients complain of new or worse constipation<sup>25,26</sup>.

After a review of our early functional results of LVR for ERP, we hypothesized that IRP and ERP are both on a spectral continuum of prolapse disease, and thus share a common pathophysiology. If this hypothesis were true, then similar results might be expected in high-grade IRP. Our results seem to support this hypothesis, as have the results of Slawik and Silvis<sup>24,27</sup>. IRP rarely occurs in isolation<sup>28</sup>, and is frequently associated with rectocele and excessive perineal descent<sup>29</sup>, often together with middle compartment or uterovaginal prolapse<sup>30</sup>. LVR has the advantage over posterior rectopexy of concomitantly dealing with these abnormalities.

Examination of published results of surgery for IRP is largely historical (Table 4). They display heterogeneity, with no standard indications for surgery, selection criteria, operative technique and functional grading criteria, making comparisons difficult. Only three authors defined the proctographic features of clinically significant IRP<sup>27,31,32</sup>, and only one used a severity-based system<sup>27</sup>. Some used clinical assessment only<sup>33</sup>, or dismissed the utility of proctography<sup>34</sup>. By contrast, the current study uses a reproducible classification system for IRP<sup>12</sup>. Only one other study<sup>35</sup> utilizes a validated scoring instrument for OD symptoms<sup>36</sup>. Unfortunately, this latter study used OD symptoms as the sole criterion for surgery, resulting in a heterogeneous group of pathologies being included which may underpin their disappointing results.

Perineal procedures have been advocated as a way of avoiding some of the functional sequelae of rectal mobilization, particularly in young males<sup>37</sup>. Functional results with internal Delorme's were reported as good in 70–75% of patients<sup>37,38</sup>. However, follow up was short and experience with this procedure in ERP has shown high recurrence at longer term follow-up<sup>26</sup>.

The current favoured perineal procedure is STARR, in practical terms a form of 'internal Altmeier' for IRP. This procedure yields encouraging results in properly-selected patients, and is likely to become an important treatment option<sup>57</sup>. While we consider LVR to be more suitable in situations such as a deep enterocele, previous hysterectomy, poor anal sphincter pressures and deeply descending perineum, there is still much work to be carried out to decide the relative place of STARR in relation to ventral rectopexy in IRP. They are likely to have complementary roles.

## Conclusion

Laparoscopic ventral rectopexy is a novel procedure for IRP, with excellent early functional outcomes and minimal morbidity. In particular, it improves OD symptoms, without inducing new-onset constipation. This mirrors our experience, and that of others, with the same procedure for ERP. Preoperative workup must be thorough, and involve multidisciplinary consultation. We continue to carefully follow up these patients to assess long-term outcomes. The principles of LVR are limited anterior rectal mobilization avoiding the rectal autonomic nerve supply, support of the anterior rectal wall, performed with a minimally invasive technique. It is based on, and further supports, the concept of a shared pathophysiology on the spectrum of prolapse disease.

| 1st author                            | Year | City/Country           | n  | F/up (mths) | Mean/median Age (yrs) | Operation  | Indication for surgery | Lateral ligaments    | Functional results                           |                          |
|---------------------------------------|------|------------------------|----|-------------|-----------------------|--|------------------------|----------------------|--|--------------------------|
|                                       |      |                        |    |             |                       |  |                        |                      | OD FI  |                          |
| <b>Posterior Rectopexy</b>            |      |                        |    |             |                       |  |                        |                      |  |                          |
| Ihre <sup>15</sup>                    | 1975 | Sweden                 | 40 | 60          | 52                    | Ripstein - TFL   | FI                     | n/s                  | n/s  | 80% improved             |
| Hoffman <sup>41</sup>                 | 1984 | St Louis               | 8  | 8           | 59                    | Ripstein - Marlex™                                       | *typical ORP symptoms' | preserved            | n/s  | n/s                      |
| McCue <sup>1</sup>                    | 1990 | London                 | 12 | 27          | 56                    | Wells - PVA sponge                                       | straining              | 'upper half' divided | 50% continued straining<br>25% worsened      | 33% improved             |
| Christiansen <sup>3</sup>             | 1992 | Copenhagen             | 24 | >12         | 66                    | Wells - Teflon® /Marlex™ (9) or Orr - rectus fascia (15) | OD with RI on DP       | divided              | 59% unchanged                                | 4/4 improved             |
| van Tets <sup>42</sup>                | 1995 | Nijmegen               | 37 | 72          | 46                    | Wells - Teflon®  | OD                     | preserved            | 70% improved                                 | n/s                      |
| Schultz <sup>24</sup>                 | 1996 | Stockholm              | 18 | 6           | 62                    | Ripstein - Marlex™                                       | FI                     | preserved            | 25% improved<br>22% worsened                 | 75% improved             |
| Briel <sup>44</sup>                   | 1997 | Rotterdam              | 13 | 67          | 65                    | Sutured posterior rectopexy                              | FI                     | preserved            | n/s  | 38% improved             |
| Schultz <sup>26</sup>                 | 2000 | Stockholm              | 30 | 65          | 62                    | Ripstein - Marlex™ or Vicryl®                            | FI                     | preserved            | 14% improved<br>45% worsened                 | 24% improved             |
| Brown <sup>46</sup>                   | 2004 | Glasgow                | 74 | 48          | 59                    | mainly Sutured posterior rectopexy                       | ORP sx and EUA         | preserved            | 50% improved<br>10% worsened                 | Improved from 49% to 22% |
| <b>Posterior Resection- Rectopexy</b> |      |                        |    |             |                       |  |                        |                      |  |                          |
| Cho <sup>45</sup>                     | 2001 | Cleveland Clin Florida | 10 | 59          | 70                    | RR (5/10), Rectopexy (1/10)                              | OD with FI             | n/s                  | 30% worsened                                 | n/s                      |
| Tsiaoussis <sup>47</sup>              | 2005 | Greece                 | 27 | 45          | 59                    | Sutured RR (4), sutured LRR (23)                         | OD                     | divided              | 93% 'satisfied' / 'very satisfied' at 1 year | 71% improved             |
| von Papen <sup>27</sup>               | 2006 | Brisbane               | 52 | 44          | 60                    | Sutured LRR  | OD                     | preserved            | 38% improved                                 | 67% improved             |

Table 4, Published internal rectal prolapse surgical series.

| 1st author                          | Year | City/ Country | n  | F/Up (mths) | Mean/ median Age (yrs) | Operation   | Indication for surgery  | Lateral ligaments | Functional results                   |               |
|-------------------------------------|------|---------------|----|-------------|------------------------|---|-------------------------|-------------------|--------------------------------------|---------------|
|                                     |      |               |    |             |                        |   |                         |                   | OD FI                                |               |
| <b>Posterior-Anterior Rectopexy</b> |      |               |    |             |                        |   |                         |                   |                                      |               |
| Orrom <sup>2</sup>                  | 1991 | Bristol       | 17 | 31          | 52                     | Posterior (6) or AP (11) rectopexy – 'synthetic material' | OD                      | divided           | 82 % poor                            | 1/1 improved  |
| Lazorthes <sup>25</sup>             | 1998 | Toulouse      | 13 | >6          | 66                     | Wells (8) and Orr (6) – Marlex <sup>TM</sup>              | FI and RAI              | preserved         | 23 % improved<br>0 % worsened        | 92 % improved |
| Portier <sup>4,8</sup>              | 2006 | Toulouse      | 22 | 28          | 0                      | Open O-L (47), Laparoscopic O-L (26); polypropylene       | OD and FI               | preserved         | 60 % improved<br>9 % worsened        | 70 % improved |
| <b>Anterior Rectopexy</b>           |      |               |    |             |                        |   |                         |                   |                                      |               |
| Silvis <sup>12</sup>                | 1999 | Utrecht       | 27 | 48          | 56                     | Open Rectovaginoxpey – Gore-tex®                          | OD and FI               | preserved         | 71 % improved<br>6 % worsened        | 53 % improved |
| Slawik <sup>11</sup>                | 2007 | Bristol       | 36 | 54          | 59                     | LAR - polypropylene                                       | OD                      | preserved         | 80% improved<br>4% worsened          | 91% improved  |
| van den Esschert <sup>2,8</sup>     | 2008 | Holland       | 17 | 38          | 55                     | LAR – Goretex® or Prolene                                 | OD (RI not spec stated) | preserved         | No sig diff in ODS<br>88% 'improved' | n/s           |
| Collinson                           | 2010 | Oxford        | 75 | 12          | 58                     | LAR-polypropylene   | OD                      | preserved         | 86 % improved                        | 85% improved  |

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**Colonic slow transit does not adversely influence the outcome of laparoscopic ventral rectopexy for obstructed defaecation**

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*Submitted*



# Abstract

**Objective:** Slow colonic transit co-exists with outlet obstruction but it is unclear whether its presence adversely influences the results of outlet obstruction surgery. We aimed to compare the functional results of laparoscopic ventral rectopexy for obstructed defaecation secondary to high-grade internal rectal prolapse in those with normal and slow colonic transit.

**Method:** Patients were evaluated with defecating proctography and colonic transit study. Those with high-grade internal rectal prolapse and significant symptoms not responding to conservative management including biofeedback were offered surgery. Bowel function was prospectively assessed pre-op and 12 months post-op using Wexner constipation score and Faecal Incontinence Severity Index (FISI).

**Results:** 63 patients underwent laparoscopic ventral rectopexy, 42 with normal and 21 slow colonic transit (mean colonic transit time 21.1 versus 87.3 hours, respectively,  $p < 0.0001$ ). Preoperatively, there was no significant difference between the two groups in age, sex, presentation, Wexner constipation score (mean 13.4 versus 13.8, respectively,  $p = 0.72$ ) or FISI score (mean 22.2 versus 25.9,  $p = 0.46$ ). The Wexner constipation score was significantly reduced in both groups at 12 months ( $p < 0.0001$ ). There was a significant reduction in FISI score at 12 months in the slow transit ( $p = 0.002$ ) but not the normal transit group ( $p = 0.056$ ). At 12 months post-op there was no significant difference between the two groups in Wexner constipation score (mean 8.5 versus 10.7,  $p = 0.14$ ) or FISI score (mean 15.3 versus 16.5,  $p = 0.82$ ).

**Conclusion:** Slow colonic transit has no adverse impact on the functional outcome of laparoscopic ventral rectopexy for obstructed defaecation due to high-grade internal rectal prolapse.

## Introduction

Traditionally surgical patients with chronic constipation have been placed in one of three groups: those with slow transit constipation, outlet obstruction or mixed slow transit/outlet obstruction<sup>1</sup>, as determined by defaecating proctography and colonic transit studies.

Subtotal colectomy is now only occasionally offered to patients with severe intractable symptoms from slow transit constipation. Longer-term results have been variable<sup>2</sup> with significant short and long term complications<sup>3,4</sup>. The results of colectomy have been particularly unsatisfactory in the presence of mixed slow transit/outlet obstruction, with persistent evacuatory difficulties in patients<sup>5,6</sup>. Most surgeons now avoid colectomy for slow transit constipation, and current therapy is largely medical with laxatives and enemas.

At the same time, surgery for outlet obstruction is currently undergoing a renaissance. The pathological significance of internal rectal prolapse has been re-appraised<sup>7</sup>, and the results of autonomic nerve-sparing laparoscopic ventral rectopexy and stapled transanal resection of the rectum (STARR procedure) have shown considerable improvement in functional and safety outcomes compared to historical controls of open posterior rectopexy<sup>8-11</sup>.

It is not known what influence the presence of additional slow colonic transit has on the outcomes of outlet obstruction surgery for internal rectal prolapse. The aim of this study was to compare the functional outcomes of laparoscopic ventral rectopexy for high-grade internal rectal prolapse in those with both normal and slow colonic transit.

## Method

Since January 2005 all patients referred to a tertiary level pelvic floor clinic have had details entered into a prospectively maintained database (Filemaker Pro, Filemaker Pro Inc, Santa Clara, CA). All patients with a history and examination consistent with outlet obstruction constipation are assessed with defecating proctography, anorectal physiology, manometry and transit studies. All patients were assessed with symptom scores (Wexner constipation score and Faecal Incontinence Severity Index) at baseline and at 12 months.

Transit studies were performed using the French radio-opaque marker single x-ray technique of Danquechin Dorval<sup>12</sup> which allows calculation of actual colonic transit time by a mathematic formula. Ingestion of 10 radio-opaque markers was undertaken daily for 6 days and a single abdomen- pelvic x-ray was performed on day 7. Transit time was calculated by multiplying the number of markers remaining in the colon by 2.4. A transit time of greater than 50.4 hours was considered abnormal.

Proctography was performed according to a standardised protocol. A 310ml mixture of 100ml barium sulphate paste (Baritop, Barium Sulphate 94.6% w/w, Sano-chemia Ltd, Bristol, UK) and 10ml of contrast (Gastrograffin, Scherring Healthcare Ltd, UK) were ingested orally 30 minutes prior to the procedure to opacify the small bowel. Immediately prior to the procedure with the patient in the left lateral position 100ml of barium paste (Barium Sulphate cream, 60% w/w, E-Z-EM, Canada) was injected per anum into the rectum using a 50ml bladder syringe. The patient was then seated on a Perspex commode. Lateral X-rays were taken with a Siemens Sireskop SD image intensifier (Siemens AG, Forchheim, Germany) at 3 pulses/second, with the patient at rest, during squeeze and during evacuation for 30 seconds. Proctograms were performed and reported by a radiologist and colorectal surgeon with an interest in pelvic floor imaging. Prolapse grade was recorded using the Oxford Rectal Prolapse Grading system<sup>13</sup> (figure 2, table 1, page 12,13).

Our unit policy on outlet obstruction was as follows: from August 2005, patients with high-grade (Oxford grade 3 and 4) internal rectal prolapse, significant outlet obstruction symptoms resistant to conservative measures and normal colonic transit were offered laparoscopy ventral rectopexy. From 2007, the presence of slow colonic transit was no longer regarded as an absolute contraindication to outlet obstruction surgery. With the pressure of increasing referrals from gastroenterology of patients with outlet obstruction and slow colonic transit, this contraindication was relaxed. It was anticipated that improvement in the outlet obstruction component of the mixed problem might allow better medical management of the slow transit. The expectation was that functional outcomes would be inferior to those with normal colonic transit, and patients were carefully counseled accordingly. Prospective data were kept on functional outcomes in these patients and this paper reports these results.

Analysis was performed using Microsoft Excel and Graphpad. Data was tested for normality using a Kolmogorov- Smirnov test. Statistical analysis was performed using unpaired t-test with Welch correction for parametric data and Mann-Whitney U test for non-parametric data. Statistical significance was defined as a p value of <0.05.

# Results

## Demographics

A total of 63 patients were identified, 42 with normal colonic transit and 21 with delayed colonic transit. 95% were female and 5% were male and the mean age was 55.2 years (range 20 to 84 years). There was no significant difference in the 2 patient groups in terms of age, sex, presenting complaint (table 1). By definition, colonic transit time was longer in the slow transit group.

|                                 | Slow transit | Normal transit | p value  |
|---------------------------------|--------------|----------------|----------|
| number                          | 21           | 42             |          |
| Mean colonic transit time (hrs) | 87.3         | 21.1           | P<0.0001 |
| Mean age (yrs)                  | 56.6         | 54.9           |          |
| % females                       | 100          | 93             |          |
| Presentation                    |              |                |          |
| OD                              | 7 (33%)      | 15 (36%)       |          |
| Mixed OD/FI                     | 12 (57%)     | 23 (55%)       |          |
| FI                              | 1 (5%)       | 1 (2%)         |          |
| Pain/ prolapse                  | 1 (5%)       | 2 (5%)         |          |

**Table 1,** Demographics.

OD= obstructed defaecation, FI= faecal incontinence.

## Outlet obstruction with normal transit group

### *Pre versus post-op constipation score*

The mean pre-op Wexner constipation score was 13.4 (standard error 0.74, range 0 to 22). The mean 12 month Wexner constipation score was 8.5 (s.e. 0.68; 1 to 20). The mean change in Wexner constipation score was -4.9 (s.e. 5.1; -6 to 16). There was a significant reduction in Wexner constipation score between pre-op and 12 months post-op ( $p<0.0001$ ).

### *Pre versus post-op faecal incontinence score*

The mean pre-op FISI was 22.2 (2.7; range 0 to 61). The mean 12 month FISI score was 15.3 (2.1; 0 to 43). The mean change in FISI score was -7.0 (2.4; -23 to 43). There was a reduction in FISI score between pre-op and 12 months post-op ( $p=0.056$ ).

## Outlet obstruction with slow transit group

### *Pre versus post-op constipation score*

The mean pre-op Wexner constipation score was 13.7 (0.76; 4 to 19). The mean 12 month Wexner constipation score was 10.7 (1.2; 2 to 19). The mean change in Wexner constipation score was -3.1, (0.6; -4 to 14). There was a significant reduction in Wexner constipation score between pre-op and 12 months post-op ( $p<0.0001$ ).

### *Pre versus post-op faecal incontinence score*

The mean pre-op FISI was 25.9, (4.0; 0 to 53). The mean 12 month FISI was 16.5 (4.1; 0 to 61). The mean change in FISI score was -9.4, (1.8, -33 to 15). There was a significant reduction in FISI score between pre-op and 12 months post-op ( $p=0.002$ ).

### Normal versus slow transit

Comparison of pre-op Wexner constipation scores ( $p=0.72$ ) and 12 months post-op constipation scores ( $p=0.14$ ) between those with normal transit or slow transit did not reveal any significant difference (table 2). Comparison of baseline FISI ( $p=0.46$ ) and 12 month FISI ( $p=0.82$ ) between the two groups also revealed no significant difference.

|                            | Slow transit | Normal transit | p value (normal v slow) |
|----------------------------|--------------|----------------|-------------------------|
| <b>Number</b>              | 21           | 42             |                         |
| <b>Wexner score (mean)</b> |              |                |                         |
| Pre-op                     | 13.8         | 13.4           | 0.72                    |
| 12 months post-op          | 10.7         | 8.5            | 0.14                    |
| Reduction (%)              | 3.1 (22%)    | 4.9 (37%)      |                         |
| P value (pre vs. post-op)  | <0.0001      | <0.0001        |                         |
| <b>FISI score (mean)</b>   |              |                |                         |
| Pre-op                     | 25.9         | 22.2           | 0.46                    |
| 12 months post-op          | 16.5         | 15.3           | 0.82                    |
| Reduction (%)              | 9.4 (36%)    | 6.9 (31%)      |                         |
| P value (pre vs. post-op)  | 0.002        | 0.056          |                         |

Table 2, Functional results.

## Discussion

This study has shown that there is no significant difference in the one year outcomes of patients undergoing laparoscopic ventral rectopexy between those with high-grade internal rectal prolapse associated with slow transit constipation, and those associated with normal colonic transit. Thus patients with outlet obstruction, internal prolapse and significant symptom burden, who have failed a course of conservative management, can be considered for surgery regardless of transit time.

Rome III<sup>14</sup> provides a modern definition for functional constipation but it does not distinguish between slow transit constipation and outlet obstruction. In practice it has been accepted that those with a feeling of incomplete evacuation, straining, tenesmus, and assistance of evacuation, rather than stool infrequency, are more likely to have outlet obstruction<sup>1</sup>, but symptoms have limited predictive ability<sup>7</sup>. Physical examination can often identify internal rectal prolapse and those requiring proctography<sup>15</sup>.

The diagnosis of slow transit constipation requires demonstration of delayed colonic transit on radio-opaque marker or nuclear studies. Slow transit constipation often co-exists with outlet obstruction in a mixed figure. Interestingly the segmental pattern of slow transit within the colon has not been shown to be predictive of the presence or absence of obstructed defaecation<sup>16</sup>.

There is very little published on the treatment of patients with mixed slow transit/outlet obstruction constipation therefore the optimal treatment of these patients is unknown. Biofeedback has been shown to be beneficial for both obstructed defaecation and slow transit constipation, and since many units have adopted an almost exclusively conservative approach to chronic constipation using laxatives and biofeedback, this has become a common approach for patients with a mixed slow transit/outlet obstruction constipation.<sup>17</sup>

In those with a more traditional surgical approach to slow transit constipation, biofeedback has been used to treat the outlet obstruction, after which subtotal colectomy is deployed for the treat the slow transit component.<sup>18</sup> However, this approach has yielded mixed results especially in the resolution of outlet obstruction symptoms, many of which historically have been poorly elicited and investigated.<sup>5</sup> The long term failure rate, significant mortality, morbidity and stoma rate has led to many anyway to abandon subtotal colectomy as tool for chronic constipation.<sup>19</sup>

The evolution of outlet obstruction surgery for internal rectal prolapse has now been well charted, with both laparoscopic ventral rectopexy and STARR procedure now offering safe and effective methods of treatment in patients who have failed conservative measures.<sup>20</sup> The twin dogmas of the 1980's and 90's that internal rectal prolapse is an incidental variant of normal<sup>21</sup> and that surgery is not recommended due to poor functional outcomes<sup>22</sup> has been overturned by new published radiological<sup>23,24</sup> and surgical evidence.<sup>8-11</sup> As a result, colorectal surgeons are increasingly confident and well-supported in number offering suitable patients surgical treatment for internal rectal prolapse causing obstructed defaecation.

Early reports of laparoscopic ventral rectopexy for obstructed defaecation either ignore<sup>9</sup> colonic transit or cautiously exclude<sup>8</sup> patients with abnormal transit studies. The present study rather surprisingly and contrary to our suspicions, shows that patients with outlet obstruction from high-grade internal rectal prolapse can be offered laparoscopic ventral rectopexy in the presence of associated slow transit constipation, and can expect similar functional outcomes to those with pure outlet obstruction.

Why might outcomes be similar between those with normal and slow transit? It has been shown that constipated patients have altered colonic motility and response to cholinergic stimulation but maintain colonic response on waking,<sup>25-27</sup> suggesting changes in local nervous stimulation. However it has not been shown whether these abnormalities are due to a primary pan colonic dysmotility problem, or are secondary to outlet obstruction. It has also been shown that colonic transit time can vary widely with time.<sup>28</sup> It is also possible that prolonged colonic transit time may occur secondary to and be improved by treatment of outlet obstruction. Our data also support the idea that delayed colonic transit is not particularly clinically significant, and that good functional improvements can be obtained despite disregarding it, though it is unclear what further

benefit may be achievable by subtotal colectomy after correction of outlet obstruction in such patients. Caution must therefore be exercised in assessing the power of transit studies to diagnose a colonic motility problem in those with obstructed defaecation. It is perhaps over-simplistic to consider outlet obstruction and slow transit as distinct clinical entities.

There are limitations to this study. The first relates to the selection of patients in this study as they are patients derived from a tertiary referral clinic and they may not be representative of constipated patients as a whole. Furthermore, many patients coming to our clinic with outlet obstruction and/or slow transit constipation are not offered surgery. This was most commonly because they reported a good response to conservative measures. Secondly, we did not impose restrictions on laxative use after (nor indeed before) surgery and some of the benefit may have derived from this. However, patients were encouraged to maximise any potential pharmacological benefit prior to surgery. Thirdly, patient numbers are relatively small. Whilst Wexner scores improve significantly in both normal and slow transit groups, the improvement is less marked in the slow transit group, though this does not attain statistical significance. Finally, we have not documented post operative transit times, preferring to accept symptomatic improvement as the more important post-operative parameter.

We conclude that slow colonic transit has no adverse impact on the functional outcome of laparoscopic ventral rectopexy for obstructed defaecation due to high-grade internal rectal prolapse.

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## Chapter 9

### **Laparoscopic anterior rectopexy for external rectal prolapse is safe and effective in the elderly. Does this make perineal procedures obsolete?**

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# Aabstract

**Objective:** To assess the safety of laparoscopic ventral rectopexy in elderly patients, compared with perineal approaches.

**Background:** Perineal approaches are considered to be the “gold standard” in treating elderly patients with external rectal prolapse (ERP) because morbidity and mortality are lower compared with trans-abdominal approaches. Higher recurrence rates and poorer function are tolerated as a compromise.

**Method:** The prospectively collected databases from two tertiary referral pelvic floor units were interrogated to identify outcome in patients of 80 or more years of age with full thickness ERP treated by laparoscopic ventral rectopexy. Primary end-points were age, ASA grade, mortality, major and minor morbidity. Secondary end points were length of stay (LOS) and recurrence.

**Results:** Between January 2002 and December 2008, 80 (median age 84 (80-97) years) patients underwent laparoscopic ventral rectopexy. The average ASA grade was 2.44 (s.d. +/- 0.57) [ ASA I(2), II(42), III(35), IV(1)]. The median LOS was 3 days (range 1-37). There was no mortality and 10 (13%) patients had complications (1 major and 9 minor). At a median follow up of 23 (2 – 82) months, two (3%) patients developed a recurrent full thickness prolapse.

**Conclusion:** Laparoscopic ventral rectopexy is safe to treat full-thickness ERP in elderly patients. Mortality, morbidity and hospital stay are comparable with published rates for perineal procedures, with a tenfold lower recurrence.

## Introduction

External rectal prolapse (ERP) a circumferential, full thickness intussusception of the rectal wall with protrusion beyond the anal canal<sup>1</sup>. Its impact on the patients' quality of life is considerable. The goals of treatment are to correct the prolapse by restoring anatomy while improving function by restoring continence and improving evacuation<sup>2,3</sup>.

Numerous operations have been described, indicating an ongoing search for the ideal surgical approach<sup>2</sup>. The techniques used are divided into perineal and trans-abdominal procedures. The latter are known to have much lower long-term recurrences and better recovery of continence<sup>4,5,20</sup> at the expense of higher morbidity. Perineal procedures therefore are frequently performed in elderly patients who may not be considered fit enough for abdominal surgery. Higher recurrence rates (up to 16% with Altemeier's and up to 38 % with Delorme procedure)<sup>5</sup> and poorer functional results with unpredictable recovery of continence<sup>4,5,20</sup> are accepted as a compromise.

The use of laparoscopic surgery in treating prolapse has challenged the classical view of management of full thickness external prolapse. Since these have in general been adaptations of classical open procedures, recurrence rates (<5%) and functional results are comparable to open trans-abdominal operations<sup>6-16</sup>. A laparoscopic approach is associated with lower cost through a reduction in hospital stay and faster patient recovery<sup>19</sup>. More importantly, it is associated with a significant reduction in morbidity<sup>6,17-20</sup>. This has lead necessarily to a reappraisal of the traditional balance between perineal and trans-abdominal procedures. Recently autonomic nerve-sparing anterior or ventral rectopexy has been shown to be a further advance. D'Hoore et al. have described laparoscopic ventral mesh rectopexy (LVR) and have reported the results in 109 consecutive patients with external rectal prolapse<sup>21,22</sup>. By creating a pocket at the level of the rectovaginal septum, ventrally to the rectal wall, dissection is kept to a minimum. Apart from avoiding the posterior rectal dissection with the risk of producing rectal denervation by damage to the lateral ligaments, the morbidity is low.

We have demonstrated the reproducibility of this technique<sup>24</sup>. The primary aim of this study was to evaluate mortality and morbidity in elderly patients with full thickness external rectal prolapse, a group traditionally managed by perineal approaches. The secondary aims were to assess length of hospital stay and rate of recurrent full-thickness external rectal prolapse. We aimed to compare the primary and secondary outcome measures to those published in perineal procedures for rectal prolapse.

## Method

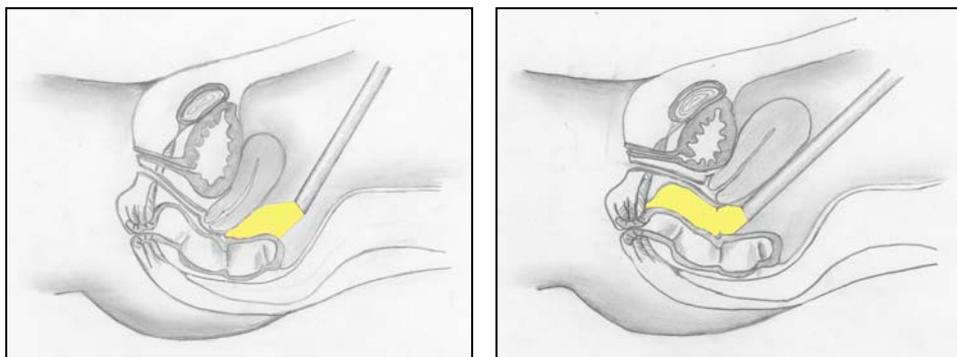
Between January 2002 and December 2008, 80 patients with a full thickness external rectal prolapse of 80 years of age or older, were operated on in two different centres with tertiary referral pelvic floor expertise (Churchill Hospital, Oxford and Frenchay Hospital, Bristol).

The diagnosis of full-thickness external rectal prolapse was made clinically, or when suspected, confirmed by defaecation proctography. Patients underwent preoperative colonoscopy or flexible sigmoidoscopy to exclude organic disease.

Of the 80 patients some (January 2004 to December 2006) had been previously<sup>24</sup>. The aim of this current paper was to look at LVR in elderly patients in particular those who would previously have been treated by a perineal procedure.

### Surgical technique

The technique of LVR has been described elsewhere<sup>21,22,23</sup>. Peri-operatively prophylactic intra-venous antibiotics are administered. The patient is positioned in Lloyd-Davies with hip flexion. A 30-degree laparoscope is placed in the umbilical tube. Right iliac fossa 10mm and 5mm operating ports are inserted. A superficial peritoneal window is made to the right of the sacral promontory and extended caudally over the right outer border of the mesorectum down to the right side of the pouch of Douglas. This spares the right hypogastric nerve (deeper), ureter (more lateral) and avoids mobilisation of the mesorectum. The peritoneum posterior to the apex of the rectovaginal septum is retracted postero-cranially and the vagina is retracted antero-caudally. This results in the opening of the recto-vaginal septum.



**Figure 1**, Use of 30-degree endoscope.

A purely anterior rectal dissection is then undertaken down to the pelvic floor (figure 1), and its distal extent is confirmed by digital rectal and vaginal examination. A strip of polypropylene (3 x 20 cm) or polyester mesh is introduced and sutured as distally as possible on the anterior rectal wall/perineal body with interrupted non-resorbable

sutures (Ethibond® Excel 00, Ethicon, Edinburgh, UK). The posterior wall of the vagina is fixed with the same sutures and to create a new rectovaginal septum. The mesh is secured to the sacral promontory using three Protack staples (Autosuture, Covidien Healthcare, Gosport, UK). If the vaginal wall is not fixed as described, the vaginal vault (or cervix) is fixed to the mesh without traction by two additional sutures. The mesh is then peritonealised by suturing the free edges of the previously divided peritoneum over the mesh to provide additional ventral elevation and avoid small bowel adhesion to the mesh.

### **Anaesthetic technique**

General anaesthesia is used with short acting opioids, intravenous propofol or inhalation agents augmented by intravenous paracetamol often combined with a transversus abdominal plane block (TAP block)<sup>53</sup>. Administration of excessive amounts of intravenous water and electrolyte is avoided.

### **Data and statistical analysis**

Data on gender, age, ASA classification, mortality, morbidity, length of stay and recurrence were prospectively collected on an institutionally approved electronic database. Nonparametric data were described as median and range and parametric data as average and standard deviation.

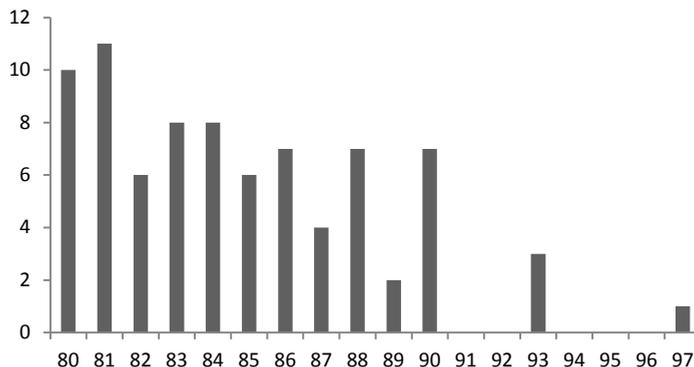
### **Ethics**

No ethical approval was needed since the operation was well established. Even in the “classic algorithm” with younger patients offered a transabdominal procedure and older patients a perineal one, there is no clear line between young or old. As our experience with LVR increased more older patients were operated upon with satisfactory results and a morbidity and mortality to a point where there was no clear benefit of a perineal procedure for patients of any age.

## **Results**

### **Patients**

Between January 2002 and December 2008, 80 patients (median age 84 [80-97] years), underwent LVR (figure 2). The average ASA grade was 2.44 (s.d. +/- 0.57) distributed into ASA I (2), II (42), III (35), IV (1). Seventy eight (98%) patients were female. Thirty-six were operated in Bristol and 44 in Oxford. During the same period, four patients underwent a perineal procedure. Thirty-three (41%) patients were operated on for a recurrent rectal prolapse including Delorme’s procedure (28) [1-12 years earlier], posterior rectopexy (2) [4 months to 9 years earlier] and Altemeier’s resection (1). Eight (10%) patients had had two or more operations.



**Figure 2,** Age distribution.  
X-axis: age (yrs), Y-axis: number.

### **Morbidity and Mortality**

There was one (1%) major complication (an on-table inferior myocardial infarction successfully paced) and 12 minor complications in 9 (11%) patients (table 1). There was no mortality. The most common complications were chest infection, port site hernia and urinary tract infection. There were no mesh related complications. There was one conversion (1%) for widespread abdominal and pelvic adhesions following a previous hysterectomy and a failed complicated open posterior rectopexy.

### **Length of stay and recurrence**

The median length of stay was 3 (1-37) days. The median follow up was 23 (2-82) months. Six patients (all died from unrelated causes) were lost to follow-up. Two demented patients were discharged from follow-up at 6 months. Two (3%) patients developed a recurrent full thickness prolapse at 6 and 16 months. Both were re-operated, one by a repeated LVR and the other by Delorme’s procedure. Three patients developed symptomatic recurrent/persistent mucosal prolapse, treated with an anopexy (2) and with a STARR procedure (1).

| <b>Complication</b>     | <b>Number of patients (%)</b> |
|-------------------------|-------------------------------|
| Chest infection         | 3 (4%)                        |
| Urine tract infection   | 3 (4%)                        |
| Port side hernia        | 3 (4%)                        |
| Myocardial Infarction   | 1 (1%)                        |
| Wound infection         | 1 (1%)                        |
| Fluid overload          | 1 (1%)                        |
| Small bowel obstruction | 1 (1%)                        |

**Table 1,** Morbidity.

## Discussion

Perineal procedures have been considered the “gold standard” treatment of a full-thickness external rectal prolapse in elderly patients to avoid the possible morbidity of a laparotomy. This does not mean, however, that perineal procedures are without risk. Delorme’s rectal mucosectomy has a morbidity of 12-14% and a mortality 0-5%<sup>3,25-35</sup>. Altemeier’s perineal rectosigmoidectomy has a similar risk of death (0-6%) and an even higher morbidity (5-25%)<sup>36-52</sup>. Whilst Altemeier’s procedure has better functional results than Delorme’s operation<sup>31</sup> there is the risk of anastomotic leakage.

A recent Cochrane Collaboration review concluded that laparoscopic rectopexy results in fewer postoperative complications and earlier discharge<sup>4</sup> over open methods. Other outcomes were similar in the open and laparoscopic groups, which imply that the advantages of an open abdominal approach also apply to laparoscopic surgery. Although laparoscopic rectopexy has become popular it has as yet not been advocated in the very aged who perhaps might be considered at increased risk from this approach. In this sizeable consecutive laparoscopic series of aged patients with full-thickness rectal prolapse there were no deaths and morbidity was very low with only one major complication, proof that LVR is safe. It is also very predictable with a good functional outcome<sup>26,27,28</sup>. Despite its minimal dissection, LVR also has a very low recurrent prolapse rate compared with the published recurrence rates up to 38% for perineal procedures<sup>5</sup>. D’Hoore reported that in a subgroup of 42 patients with a 5 year follow up, the recurrence rate was only 5% (two patients). Our 3% recurrence rate after a median 23-month follow up is consistent with this figure. A longer follow up is clearly desirable to see whether the rate will remain at around 3% although the two recurrences in the series occurred after only 6 and 16 months (which is below the median follow up).

A 30-degree laparoscope allows the surgeon to dissect the rectovaginal plane all the way down to the perineal body and the muscles of the pelvic floor (figure 1). The extent of this dissection can be checked during the procedure by digital vaginal or rectal examination. We believe that a good fixation of the mesh to the ventral rectal wall as distal as possible is essential to minimize recurrence. Although the ability to control a full thickness rectal prolapse with good functional results seems to be reproducible, it is very important to realise that the procedure requires practice and experience. This applies particularly to the distal fixation of the mesh to the anterior rectal wall which can be difficult at times.

LVR is now offered to every patient in our units whatever their ASA grade. Operating on these sometimes frail, elderly patients necessitates good anaesthetic care, but these elderly patients do tolerate laparoscopic surgery well. Using short acting agents and avoiding the administration of much intravenous water and electrolyte allows quick recovery within minutes after the end of surgery.

Many colorectal surgeons will feel that a perineal is much better tolerated than a transabdominal approach but anaesthesia used in perineal procedures such as a Delorme's or Altemeier's procedure has its disadvantages. The prone position is associated with unpredictable circulatory changes which often necessitate intravenous water and electrolyte boluses. Spinal anaesthesia is only practicable when the patient can be operated upon in the lithotomy position. Putting the patient prone soon after a spinal injection of local anaesthetic can lead to uncontrolled spread of the local anaesthetic, with resulting unwanted sympatholytic activity. The anaesthetist then has to respond with vasopressors and fluid boluses during surgery, leaving the patient to adjust to this change when the spinal anaesthetic wears off.

## Conclusion

LVR combines the advantages of laparoscopy (shorter hospital stay, quicker patient recovery, lower costs and less morbidity), a trans-abdominal approach (reliable improvement in incontinence, low recurrence rate) and an anterior rectal dissection (autonomic nerve-sparing, improves constipation, avoids inducing new-onset constipation). It is tolerated very well in the elderly, which makes perineal procedures indicated only in the very frail, and thus almost obsolete. The dictum of abdominal procedure if young and perineal procedure if old, should be abandoned.

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# Chapter **10**

## Summary and conclusions



The aim of this thesis is to address some fundamental questions concerning rectal prolapse. Eight studies were performed in order to investigate issues never adequately answered in literature before.

In **Chapter 1** a brief introduction on rectal prolapse is given as part of the prolapsing pelvic floor. The concept of internal rectal prolapse being a precursor of external rectal prolapse is further elucidated.

In **Chapter 2** the relationship of age to various stages of rectal prolapse using the Oxford Rectal Prolapse Grade (ORPG) is studied. A statistically significant difference in the mean ages of each group (rectal prolapse grade) was found, supporting the view of internal rectal prolapse as a precursor to external prolapse in the spectrum of rectal prolapse disease. On average males and females without vaginal delivery were younger and were found to have a faster prolapse progression rate than woman with vaginal delivery, suggesting another cause in the development of rectal prolapse. A collagen disorder, implicated in previous work, warrants closer scrutiny.

In **Chapter 3** an enumeration of symptoms caused by high-grade internal rectal prolapse and their frequency is described. Faecal incontinence (56%, of which 73% had urge faecal incontinence) was the most common symptom at presentation. Symptoms related to obstructed defaecation syndrome were the next most common, including incomplete evacuation (45%), straining (34%), digital assistance (34%) and repetitive toilet visits (33%).

In **Chapter 4** rectal sensory function in patients with obstructed defaecation and high-grade internal rectal prolapse is evaluated. Fifty-nine percent had normal sensation. Four percent had total hyposensitivity and 1% total hypersensitivity. A further 24% had partial hyposensitivity whilst 12% had partial hypersensitivity. These results rejects the hypothesis that hyposensitivity is the main and most important cause for obstructive defaecation in patients with high-grade internal rectal prolapse. Consequently a mechanical obstruction caused by the prolapsing rectal wall seems to be a better alternative to explain obstructive defaecation.

In **Chapter 5** the relationship between the presence of an enterocele and severity of rectal prolapse grade is analysed. There was a statistically significant correlation between the presence of an enterocele and increasingly severe grade of rectal prolapse, suggesting that rectal prolapse and enterocele are part of the same pelvic floor process. It supports the hypothesis that an enterocele is a marker of severe pelvic floor weakness. Apart from the severity of rectal prolapse an enterocele is seen more frequently in females particularly after hysterectomy.

In **Chapter 6** the efficacy of botulinum toxin to treat obstructed defaecation caused by radiologic anismus is analysed. The proctographic diagnostic criterion for anismus was nonemptying of barium after 30 seconds. Responders (resolution followed by recurrence of obstructed defaecation over a 1- to 2-month period) underwent repeat injection. Nonresponders underwent rectal examination under anaesthetic. Thirty-nine percent responded initially of which 95% underwent repeat treatment. Of these patients 95% percent had a sustained response and required no further treatment. Of the remaining 61% non-responders 94% were shown to have a high-grade rectal prolapse (ORPG grade 3-5) at EUA. These results show that simple proctographic criteria over diagnose anismus and under diagnose rectal prolapse. A response to an initial dose of botulinum toxin might be considered a more reliable diagnosis of anismus than proctography.

In **Chapter 7** the short-term functional results of autonomic nerve-sparing laparoscopic ventral rectopexy (LVR) for internal rectal prolapse are described. The principles of LVR are limited anterior rectal mobilization avoiding the rectal autonomic nerve supply, support of the anterior rectal wall, performed with a minimally invasive technique. Seventy-five patients with a high-grade internal rectal prolapse (ORPG grade 3 and 4) underwent LVR. Mortality (0%), major (0%) and minor morbidity (4%) were acceptably low. Median length of stay was 2 days. Constipation (Wexner score) and faecal incontinence (FISI score) improved significantly at 3 months and at 12 months. No patient had worse function. These results show that laparoscopic ventral rectopexy for internal rectal prolapse improves symptoms of obstructed defaecation and faecal incontinence in the short-term.

In **Chapter 8** the functional results of laparoscopic ventral rectopexy for obstructed defaecation secondary to high-grade internal rectal prolapse in those with normal and slow colonic transit are compared. Patients were evaluated with defaecating proctography and colonic transit study. Sixty-three patients with a high-grade internal rectal prolapse (ORPG grade 3 and 4) underwent laparoscopic ventral rectopexy, 42 with normal and 21 with slow colonic transit. The Wexner constipation score was significantly reduced in both groups at 12 months. At 12 months post-operatively there was no significant difference between the two groups in Wexner constipation score. These results show that slow colonic transit has no adverse impact on the functional outcome of laparoscopic ventral rectopexy for obstructed defaecation due to high-grade internal rectal prolapse.

In **Chapter 9** the safety of laparoscopic ventral rectopexy to treat external rectal prolapse in elderly patients, compared with perineal approaches is assessed. Eighty patients with an external rectal prolapse (median age 84 (80-97) years) underwent laparoscopic ventral rectopexy. The average ASA grade was 2.44 (s.d. +/- 0.57). The median length of stay was 3 days. There was no mortality and 10 (13%) patients had complications. At a median follow up of 23 months, two (3%) patients developed a recurrent external rectal prolapse. These results show that laparoscopic ventral rectopexy is tolerated very well in the elderly. Laparoscopic ventral rectopexy combines the advantages of laparoscopy, a trans-abdominal approach and an anterior rectal dissection. This makes that the dictum of *abdominal procedure if young and perineal procedure if old* should be abandoned.

## Conclusions

- Internal rectal prolapse precedes external rectal prolapse in the spectrum of rectal prolapse disease.
- Women without vaginal delivery and man are younger and are found to have a faster rectal prolapse progression rate than women with vaginal delivery.
- In patients with a high-grade internal rectal prolapse faecal incontinence is the most common symptom at presentation.
- Hyposensitivity is not the main and most important cause for obstructive defaecation in patients with high-grade internal rectal prolapse.
- Rectal prolapse and enterocoele seem to be part of the same pelvic floor process.
- A response to an initial dose of botulinum toxin might be considered a more reliable diagnosis of anismus than proctography.
- Laparoscopic ventral rectopexy for internal rectal prolapse improves symptoms of obstructed defaecation and faecal incontinence in the short-term.
- Slow colonic transit has no adverse impact on the functional outcome of laparoscopic ventral rectopexy for obstructed defaecation due to high-grade internal rectal prolapse.
- Laparoscopic ventral rectopexy to treat external rectal prolapse in the elderly is found to be safe. The dictum of *abdominal procedure if young and perineal procedure if old* should be abandoned.



# Chapter **11**

## **Samenvatting en conclusies in het Nederlands**



Het doel van dit proefschrift is het beantwoorden van een aantal fundamentele vragen met betrekking tot rectum prolaps. Acht studies zijn verricht om deze vragen betreffende rectum prolaps te bestuderen welke nooit eerder adequaat zijn beantwoord in de literatuur.

In **Hoofdstuk 1** wordt een korte introductie gegeven over rectum prolaps als onderdeel van bekkenbodembodem verzakking. Het concept dat interne rectum prolaps voorafgaat aan externe rectum prolaps wordt nader uiteengezet.

In **Hoofdstuk 2** wordt de relatie tussen leeftijd en de verschillende stadia van rectum prolapse bestudeerd gebruikmakend van de *Oxford Rectal Prolapse Grade (ORPG)*. Een statistisch significant verschil in gemiddelde leeftijd tussen de verschillende groepen (rectum prolaps graad) werd gevonden. Dit onderbouwt de hypothese dat interne rectum prolaps een voorstadium is van externe rectum prolaps in het spectrum van opeenvolgende stadia in rectum prolaps. Gemiddeld waren vrouwen zonder vaginale bevallingen en mannen jonger en hadden ze een snellere progressie in de ontwikkeling van rectum prolaps dan vrouwen met een vaginale bevalling. Dit suggereert een andere oorzaak voor het ontwikkelen van rectum prolaps. Een collageen aandoening, door anderen reeds eerder gesuggereerd, verdient beter en nader onderzoek.

In **Hoofdstuk 3** wordt een opsomming van symptomen beschreven veroorzaakt door hooggradige interne rectum prolaps. Faecale incontinentie (56%, waarvan 73% urge faecale incontinentie) was het meest voorkomende symptoom bij presentatie. Symptomen gerelateerd aan obstructieve defaecatie syndroom waren daaropvolgend het meest voorkomend, waaronder incomplete evacuatie (45%), persen (34%), digitale assistentie (34%) en herhaald toilet bezoek (33%).

In **Hoofdstuk 4** wordt de rectale sensorische functie van patiënten met obstructieve defaecatie en hooggradige interne rectum prolaps geëvalueerd. Negenenvijftig procent had een normale sensitiviteit. Vier procent had een volledige hyposensitiviteit en 1% had een volledige hypersensitiviteit. Vervolgens had 24% een partiële hyposensitiviteit terwijl 12 % een partiële hypersensitiviteit had. Deze resultaten verwerpen de hypothese dat hyposensitiviteit de meest belangrijke oorzaak is voor obstructieve defaecatie bij patiënten met hooggradige interne rectum prolaps. Derhalve lijkt een mechanische obstructie veroorzaakt door de prolaberende rectumwand een beter alternatief als verklaring voor obstructieve defaecatie.

In **Hoofdstuk 5** wordt de relatie tussen de aanwezigheid van een enterocèle en de ernst van rectum prolaps gradering geanalyseerd. Er was een statistisch significante correlatie tussen de aanwezigheid van een enterocèle en de in ernst toenemende gradering van rectum prolaps, suggererend dat rectum prolaps en enterocèle deel uitmaken van hetzelfde proces bij de verzakking van de bekkenbodem. Afgezien van de ernst van rectum prolaps wordt een enterocèle vaker gezien bij vrouwen met name na het ondergaan van een hysterectomie.

In **Hoofdstuk 6** wordt de effectiviteit van botuline toxine als therapie voor obstructieve defaecatie veroorzaakt door radiologische anismus geanalyseerd. Het proctografisch diagnostisch criterium voor anismus is het niet evacueren van bariumcontrast binnen 30 seconden. “Responders” (dat wil zeggen verbetering van klachten gevolgd door een recurrence van klachten van obstructieve defaecatie na 1 tot 2 maanden) ondergingen een tweede injectie. “Nonresponders” ondergingen een rectaal onderzoek onder narcose. Negenendertig procent had aanvankelijk een verbetering van klachten (responders) waarvan 95% een tweede injectie ondergingen. Het effect hiervan was voor 95% blijvend en hadden geen verdere therapie nodig. Van de resterende 61% (nonresponders) bleek 94% een hooggradige rectum prolaps (graad 3-5) te hebben bij onderzoek onder narcose. Deze resultaten tonen aan dat eenvoudige proctografische criteria de aanwezigheid van anismus overdiagnosticeren en de aanwezigheid van rectum prolaps onderdiagnosticeren. Voor het aantonen van anismus mag een succesvol resultaat na een initiële injectie met botuline toxine als een beter diagnosticum beschouwd worden dan proctografie.

In **Hoofdstuk 7** worden de functionele korte termijn resultaten van een autonoom-zenuw sparende laparoscopische ventrale rectopexie (LVR) voor interne rectum prolaps beschreven. De principes van LVR zijn gelimiteerde anterieure mobilisatie waarbij schade aan de autonome zenuw innervatie van het rectum wordt vermeden, ondersteuning wordt gegeven aan de ventrale rectumwand en uitgevoerd met minimaal invasieve techniek. Vijfenzeventig patiënten met een hooggradige interne rectum prolaps (ORPG 3 en 4) ondergingen een LVR. Mortaliteit (0%), majeure (0%) en mineure morbiditeit (4%) was acceptabel laag. De mediane opnameduur was 2 dagen. Constipatie (Wexner score) en faecale incontinentie (FISI score) verbeterden significant na 3 en 12 maanden. Geen verergering van functionele klachten. Deze resultaten tonen aan dat een laparoscopische ventrale rectopexie voor interne rectum prolaps symptomen van obstructieve defaecatie en faecale incontinentie op korte termijn verbetert.

In **Hoofdstuk 8** worden de functionele resultaten van de laparoscopische ventrale rectopexie voor obstructieve defaecatie als gevolg van hooggradige interne rectum prolaps vergeleken tussen patiënten met en zonder slow transit constipatie. Patiënten werden geëvalueerd met een defaecogram en een transit studie. Drieënzestig patiënten met een hooggradige interne rectum prolapse (ORPG graad 3 en 4) ondergingen een laparoscopische ventrale rectopexie, 42 zonder en 21 met slow transit constipatie. De Wexner constipatie score was significant verminderd in beide groepen na 12 maanden. Twaalf maanden postoperatief was er geen significant verschil in de Wexner constipatie score tussen beide groepen. Deze resultaten laten zien dat slow transit constipatie geen nadelige invloed heeft op de functionele resultaten van de laparoscopische ventrale rectopexie voor de behandeling van obstructieve defaecatie veroorzaakt door een hooggradige interne rectum prolaps.

In **Hoofdstuk 9** wordt de balans opgemaakt omtrent de veiligheid van de laparoscopische ventrale rectopexie als behandeling van externe rectum prolaps bij bejaarde patiënten, vergeleken met perineale procedures. Tachtig patiënten met een externe rectum prolaps (mediane leeftijd 84 (80-97) jaar) ondergingen een laparoscopische ventrale rectopexie. De gemiddelde ASA classificatie was 2.44 (s.d. +/- 0.57). De mediane opnameduur was 3 dagen. Er was geen mortaliteit en 10 (13%) patiënten kenden een gecompliceerd beloop. Na een mediane follow-up van 23 maanden ontwikkelden 2 patiënten (3%) een recidief externe rectum prolaps. Deze resultaten tonen aan dat de laparoscopische ventrale rectopexie goed getolereerd wordt door bejaarde patiënten. De laparoscopische ventrale rectopexie combineert de voordelen van laparoscopie, een transabdominale benadering en een anterieure rectale dissectie. Dit maakt dat het adagium *abdominale procedure voor jonge en perineale procedure voor de oudere* obsoleet is geworden.

## Conclusies

- Interne rectum prolaps is een voorstadium van externe rectum prolaps in het spectrum van opeenvolgende stadia in rectum prolaps.
- Vrouwen zonder vaginale bevallingen en mannen zijn jonger en hadden een snellere progressie in de ontwikkeling van rectum prolaps dan vrouwen met een vaginale bevalling.
- Bij patiënten met hooggradige interne rectum prolaps is faecale incontinentie het meest voorkomende symptoom bij presentatie.
- Hyposensitiviteit is niet de meest belangrijke oorzaak voor obstructieve defaecatie bij patiënten met hooggradige interne rectum prolaps.
- Rectum prolaps en enterocèle lijken deel uit te maken van hetzelfde proces bij de verzakking van de bekkenbodem.

- Voor het aantonen van anismus mag een succesvol resultaat na een initiële injectie met botuline toxine als een beter diagnosticum beschouwd worden dan proctografie.
- Laparoscopische ventrale rectopexie voor interne rectum prolaps verbetert symptomen van obstructieve defaecatie en faecale incontinentie op korte termijn.
- Slow transit constipatie heeft geen nadelige invloed op de functionele resultaten van de laparoscopische ventrale rectopexie voor de behandeling van obstructieve defaecatie veroorzaakt door een hooggradige interne rectum prolaps.
- Laparoscopische ventrale rectopexy als behandeling van externe rectum prolaps bij bejaarde patiënten is veilig gebleken. Het adagium *abdominale procedure voor jonge en perineale procedure voor de oudere* is obsoleet geworden.

# Chapter 12

## Future perspectives



Although with this thesis some light has been shattered upon the somewhat obscure scientific field concerning rectal prolapse surgery, many questions remain unanswered. This thesis has shown that internal rectal prolapse (IRP) is likely to precede external rectal prolapse (ERP) before it protrudes through the anus. We have only captured symptomatic patients with internal rectal prolapse though. It is a possibility that not all patients with a high-grade IRP will be symptomatic as normal volunteer studies suggest. Analysing patients with a defaecography randomly and operate on those with a radiologic high-grade IRP seem to be cutting the corners.

It is mandatory that the symptoms play the major role in the decision whether to operate or not. We now know which symptoms are associated with high-grade IRP (chapter 3). What we have shown is that about 85% of patients with high-grade IRP improve symptoms of obstructive defaecation and/or faecal incontinence after a laparoscopic ventral rectopexy (LVR). This indirectly proves the concept that IRP as part of the descending perineum syndrome actually causes symptoms of obstructive defaecation and faecal incontinence otherwise why would correcting the anatomy with a LVR improve these symptoms. More interesting is the remaining 15% who do not improve after LVR. Are these patients the presumed “asymptomatic” high-grade IRP patients with other functional disorders to cause their symptoms? This is a relevant question which needs to be answered as good as possible before the decision is made to operate. Thorough pre-operative analysis including an endo-anal ultrasonography, manometrie and a transit study (in case of obstructive defaecation) should be done to exclude other causes for functional complaints and provide a complete picture. This also gives us the opportunity for re-analysing the remaining 15% whose symptoms did not improve. Many remaining question can be easily answered. Did patients with faecal incontinence who did not respond to surgery have sphincter defects with significant pressure reduction? If so can a threshold be obtained? Is a reduction in rectal compliance associated with urge faecal incontinence? Are symptoms of obstructed defaecation and faecal incontinence affected evenly? Etcetera.

A second explanation could be that the surgical technique is shortcoming. A study with postoperative investigations (defaecography, manometrie, endo-anal ultrasonography and transit study) can probably answer this question. In my opinion the way the mesh is attached to the ventral rectal wall can be decisive. Should a douglasectomy be performed to allow a better fixation to the rectal wall? How tight should the mesh be attached to the promontory keeping in mind that polypropylene meshes will shrink significantly in time? Are light weight meshes as effective? A large (inter)national audit for functional colorectal surgery, at which all of the different data on symptoms, physiology and outcome of treatment is prospectively collected, will be of great value. What will the long-term results be of LVR for high-grade IRP and especially the long-term mesh related complications? In our series after a median follow up of 12 months no mesh related complications were observed. Mesh related complication after gynaecological transperineal procedures for urine stress incontinence has caused the FDA to question

the legitimacy of these procedures in the United States<sup>1</sup>. Much of these complications were already noted after short duration follow-up (2 years) though. These techniques rather differ in aspect (apart from using a polypropylene mesh) and are therefore incomparable. Nonetheless it is not known what the long-term effects (and results) will be and it is important to have these results as soon as possible. Before the long-term results are known I believe it is mandatory to discuss this with the patient before operation. In this thesis no data is published on sexual function. Critics may interpret this as withholding negative side effects of LVR. The truth is that we did not study (implement it in our prospective database) sexual function after LVR yet. Our personal observation is that it actually seems to improve sexual function. A recently accepted paper to be published by Abet et al.<sup>2</sup> has confirmed this hypothesis.

For symptoms of obstructed defaecation the Wexner constipation score is used in this thesis<sup>3</sup>. This constipation score is meant to be used for patients with constipation in general though and not specifically designed for symptoms of obstructive defaecation. Symptoms as seen in patients with slow transit constipation play a large role in this scoring system. When patients with high-grade IRP are identified differentiation between symptoms of slow transit constipation (hard stool, reduced frequency of stool, bloating, and abdominal pain) and obstructive defaecation is mandatory. A better score designed for symptoms of obstructed defaecation is the Altomare ODS score<sup>4</sup>. This score is far from perfect though and symptoms of slow transit constipation are still included such as stool consistency and the use of laxatives and or enemas where as in patients with obstructive defaecation a prominent observation is that often symptoms of obstructed defaecation remain *despite* normal consistency of stool.

More importantly faecal incontinence is not included in the Altomare ODS score at all. A phenomenon often seen in patients with high-grade IRP, with both symptoms of obstructive defaecation and faecal incontinence, is that when the stool is medically softened (with laxatives) symptoms of faecal incontinence are predominant where as if the stool is medically hardened (with loperamide syrup) symptoms of obstructive defaecation become predominant. When research is done on which symptoms (as described in Chapter 3) respond well after LVR a better scoring system can be developed. If validated as well it is likely that a better prognosis of outcome of surgery can be obtained.

Clearly more research is needed to fully understand rectal prolapse and its pathophysiology (especially IRP). It is an interesting and dynamic field of research. Laparoscopic ventral rectopexy, with good functional outcome and low introduction of morbidity, seems to act as a catalyst. As more pieces of the puzzle are becoming available a more clear view on rectal prolapse will emerge.

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