

The added value of X-defecography and MR-defecography in clinical decision making on treatment for posterior compartment prolapse

Master Thesis Health Sciences

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ABSTRACT

Introduction X-defecography and MRI-defecography can request as an additional test for diagnosing and differentiation posterior compartment prolapse. The objective of this study was to determine the added value of X-defecography and MRI-defecography for the clinical decision-making on treatment for patients with posterior compartment prolapse.

Methods Four gynecologists were asked to fill in their treatment plan per patient for 32 cases for three different steps. Step 1 consist of information on the anamneses and the POP-Q. Step 2 consist of Step 1, including X-defecography (group A) or MRI-defecography (group B). In Step 3, they all received the information of Step 1 including X-defecography and MRI-defecography. Data analysis solely focussed on the assessment of changes in the gynaecological treatment plan of the posterior compartment.

Results In group A the treatment plan changes in Step 2 in 23 out of the 63 (37%) patient cases and in Step 3 in 12 out of the 63 (19%) patient cases. In group B the treatment plan changes in Step 2 in 31 out of the 64 (48%) patient cases and in Step 3 in 33 out of the 64 (52%) patient cases.

Conclusion Both X-defecography and MRI-defecography show to have an effect on the treatment plan for patients with posterior compartment prolapse. The dedicated added value of the imaging modality individually cannot be concluded yet.

INTRODUCTION

Pelvic floor disorders (PFD), such as urinary and faecal incontinence, pelvic organ prolapse (POP) and obstructed defecation, affect approximately 50% of women older than 50 years [1, 2, 3]. PFD is related to a decrease in the quality of life, and especially faecal incontinence is known to have a high level of shame and discomfort, which is one of the symptoms of posterior compartment prolapse. Posterior compartment prolapse contains several pathologies, rectocele, enterocele, peritoneocele, sigmoidocele and rectal intussusception [4].

In the Netherlands, X-ray defecography (X-defecography) is currently considered as the first choice in additional testing after anamneses and physical examination (Pelvic Organ Prolapse – Quantification (POP-Q)) for diagnosing and differentiating posterior compartment prolapse [5]. However, in some hospitals in the Netherlands and worldwide, Magnetic Resonance Imaging (MRI) defecography [6] is added to or has replaced X-defecography. Both modalities have their benefits, such as evacuation in physiological evacuation position (X-ray) or lack of radiation and good soft tissue visualisation (MRI) [1, 4, 6]. However, both imaging modalities also have their limitations, such as 2D projection, ionising radiation and lack of soft tissue information (X-ray) or assessment in a supine position (MRI) [1, 3, 4, 6, 7].

The reliability of both imaging modalities has been studied, reporting that MRI-defecography is reliable for diagnosing posterior compartment prolapse [4, 7, 8]. To the best of our knowledge, only one paper was published, evaluating the impact of X-defecography and MRI-defecography on the gynaecological treatment plan [9]. This study by Groenendijk et al. [9] describes the effect of four combined additional tests (MRI, defecography, urodynamic evaluation and anorectal function testing, including endosonography) on clinical decision making of the treatment. Gynaecologists assigned a score to rate the importance of these tests on the decision of the treatment plan. They concluded that the additional diagnostic information was often important, but not every test is equally important. They highlight the underrepresentation of patients with posterior compartment prolapse in their study. Furthermore, their study protocol did not assess the MRI defecation phase. Since the gynaecologists request defecography as an additional test, especially in patients with posterior compartment prolapse and (obstructed) defecation is one of the main

physical complaints in patients, we need to gain more certainty and clarity in the added value of these modalities on treatment planning.

This research aims to determine the added value of X-defecography and MRI-defecography after anamneses and POP-Q for the clinical decision-making on treatment for patients with posterior compartment prolapse.

MATERIALS AND METHODS

This study was conducted with forty-two patients with POP symptoms and/or obstructed defecation who visited the gynaecology or surgery department of the Ziekenhuis Groep Twente (ZGT) hospital between January 2020 and April 2021. All patients received an X-defecography and MRI-defecography within two weeks of each other. Ten patients were excluded from the study based on missing POP-Q or Baden-Walker Halfway score on physical examination (n=6), incorrect inclusion (n=3) and incorrect case description in Step 1 (n=1). The study had local approval registered as ZGT-2047, and all patients signed informed consent.

Gynaecological intake, including a physical examination (e.g. POP-Q), was done by one of the six gynecologists. The X-defecography was performed in sitting position in four different phases: rest, contraction, Valsalva manoeuvre and defaecation. The patient had to drink 200 mL of water with barium powder to fill the small intestine. Before the examination, the vagina was filled with 60 mL amidotrizoic acid to visualise the vagina on the X-defecography. The rectum was filled with 180 to 240 mL barium-based contrast agent to visualise the rectum. The MRI-defecography was performed in supine position in a 1.5T closed MRI system (Siemens Magnetom Avanto-fit). This examination consisted of three static T2 scans (sagittal, transversal and coronal) and four dynamic T2 scans in the sagittal direction (rest, contraction, Valsalva manoeuvre and defaecation). The use of a contrast agent was limited to 250 mL ultrasound gel in the rectum for better posterior visualisation.

The parameters assessed during radiological evaluation of the dynamic X- and MRI-defecography scans were presence (and severity) of rectocele, enterocele, peritoneocele (only on MRI), sigmoidocele, rectal intussusception, residue contrast agent and faecal incontinence and measuring the anorectal angle (ARA). Rectocele was radiologically quantified as the abnormal bulge's depth in the rectum wall beyond the rectum wall's expected margin on the anterior side. Enterocele, peritoneocele and sigmoidocele were radiologically quantified as a herniation of a part of the peritoneum in the space between the rectum and the vagina below the proximal one-third of the vagina. It was quantified as enterocele when it consisted of the small intestine, peritoneocele when it consisted of fatty tissue and sigmoidocele when it consisted of the sigmoid colon. Rectal intussusception was radiologically quantified as an invagination of the rectal wall into the rectum's lumen during defecation. The faecal residue was described as a contrast agent in the rectum after defecation, while faecal incontinence was described when the patient lost the faecal contrast agent before the defecation phase. The ARA was measured between the anal canal and the posterior border of the distal part of the rectum. In rest the normal physiological boundaries are between 108 to 127 degrees. In normal physiology, the ARA decreased by approximately 15 to 20 degrees during contraction and increased by approximately 15 to 20 degrees during Valsalva and defaecation.

A three-step process was conducted to determine the effect of X-defecography and MRI-defecography on clinical decision-making (Fig. 1). Four gynecologist specialised in urogynecological care were asked to fill in their differential diagnosis and treatment plan per patient solely based on the in-

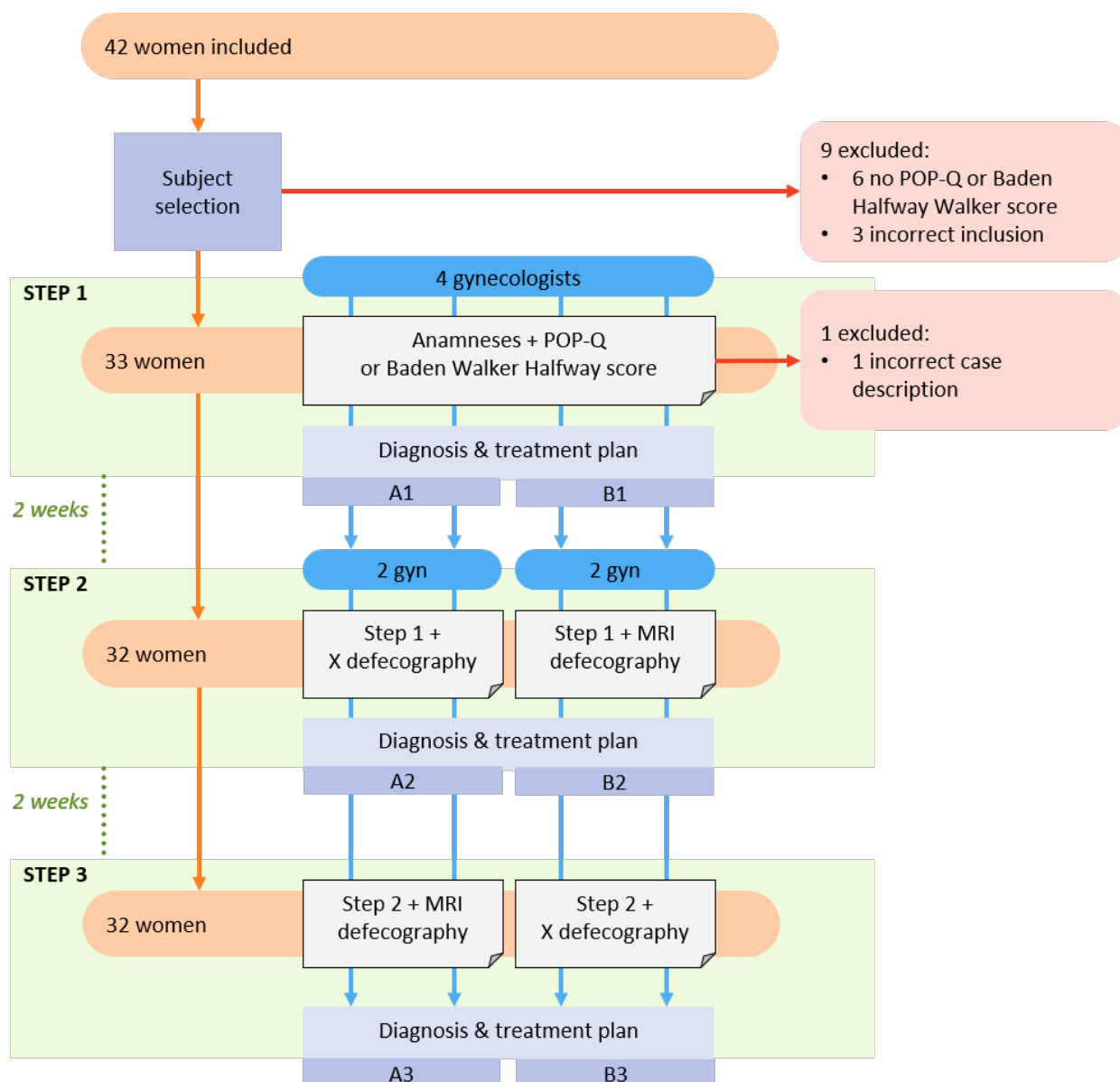


Figure 1: The three steps process

formation given per step. The cases were presented in a standardised template (Appendix A), in random order, and the time between steps was at least two weeks to minimise memory bias. In **Step 1**, the information of the anamneses, the POP-Q or Baden-Walker Halfway score, and if available, the information of additional (physical) examination (e.g. ultrasound examination, digital vaginal examination or pelvic floor function) were presented. In **Step 2**, two gynecologists (group A) received the information from Step 1, including the standardised radiological reports from the X-defecography. The two other gynecologists (group B) received the information from Step 1, including the standardised radiological reports from the MR-defecography. In **Step 3**, all gynecologists received the information from Step 1 and the standardised radiological reports of both the X-defecography and MRI-defecography.

Data analysis solely focussed on the assessment of changes in the gynaecological treatment plan of the posterior compartment. Changes were assessed based on a change between the four treatment categories. The first treatment category, "No treatment", was listed as no treatment to the

posterior compartment. The second treatment category, "Referral", was listed as a referral to the surgical or gastroenterology department. The third treatment category, "Conservative treatment", consisted of medication, pelvic floor physiotherapy and/or pessary treatment. The fourth treatment category, "Surgery", consisted of surgeries classified in the following subcategories: "vaginal correction of the posterior compartment", "laparoscopic correction using a mesh by the gynaecologist", "laparoscopic correction using a mesh by the gynaecologist and rectopexy by the surgeon", "rectopexy by the surgeon" and "reversing the previous surgery".

The changes in the treatment plan were analysed by descriptive statistics using IBM SPSS Statistics version 27.0. A change in category or subcategory was seen as a change in the treatment plan. The change was analysed for the two groups of gynecologists between Step 1 and Step 2 and between Step 2 and Step 3.

RESULTS

Patient characteristics of the 32 patients are visualised in Table 1. The mean age was 60 (SD: 12.8) years, and the median parity was two. Fourteen patients had a posterior POP-Q stage II, and nine patients had a stage III. Twenty-three patients have had previous pelvic organ or prolapse surgery, which is representative for women with these symptoms. There were two missing values in the answers given by the gynecologists of group A, one in Step 1 and one in Step 3.

Fig. 2 shows the number of treatment plan changed between steps 1 and 2 and between steps 2 and 3 for the two groups of gynecologists. Adding X-defecography in Step 2, the treatment plan changed in 23 out of the 63 (37%) patient cases. Followed by adding MRI-defecography in Step 3, the treatment plan changed in 12 out of the 63 (19%) patient cases. When MRI-defecography is added in Step 2, the treatment plan changed in 31 out of the 64 (48%) patient cases. Followed by adding X-defecography in Step 3, the treatment plan changed in 33 out of the 64 (52%) patient cases.

The recommended treatments in this cohort after Step 1 was 44 times a surgery (24 and 20 cases per group A and B, respectively) and therefore 83 times a non-surgical treatment (39 and 44 cases per group A and B, respectively). The majority of the changes after Step 2 changed from non-surgical treatment ("no treatment", "referral", or "conservative treatment") to the "surgery" category. These changes were observed in 25 out of 83 (30%) patient cases (13 and 12 cases per group A and B, respectively). The change from "surgery" to non-surgical treatment after Step 2 occurred in 4 out of 44 (11%) patient cases (2;2 cases per group A and B, respectively). Changes in the type of surgery were observed by changes in subcategories of surgery. A total of 14 out of 44 (32%) cases were indicated for a different type of surgery after evaluating the X or MR defecography results, respectively 6 and 8.

The recommended treatments in this cohort after Step 2 was 65 times a surgery (35 and 30 cases per group A and B, respectively) and therefore 63 times a non-surgical treatment (29 and 34 cases per group A and B, respectively). Step 3, adding a second type of imaging to the diagnoses, mainly resulted in subcategory changes within the surgery category (17 out of 65 (26%) cases; 5 and 12 cases per group A and B, respectively). This additional imaging additionally resulted in 12 out of 63 (19%) of the cases from the non-surgical treatments shifting to the "surgery" category (2 and 10 cases per group A and B, respectively). The category change from "surgery" to non-surgical treatment occurred in 6 out of 65 (9%) patient cases (3 and 3 cases per group A and B, respectively).

Peritoneocele can only be radiologically quantified on MRI-defecography. The most experienced urogynecologist of group A changed the treatment plan in Step 3 in 4 out of 6 patients with peritoneocele.

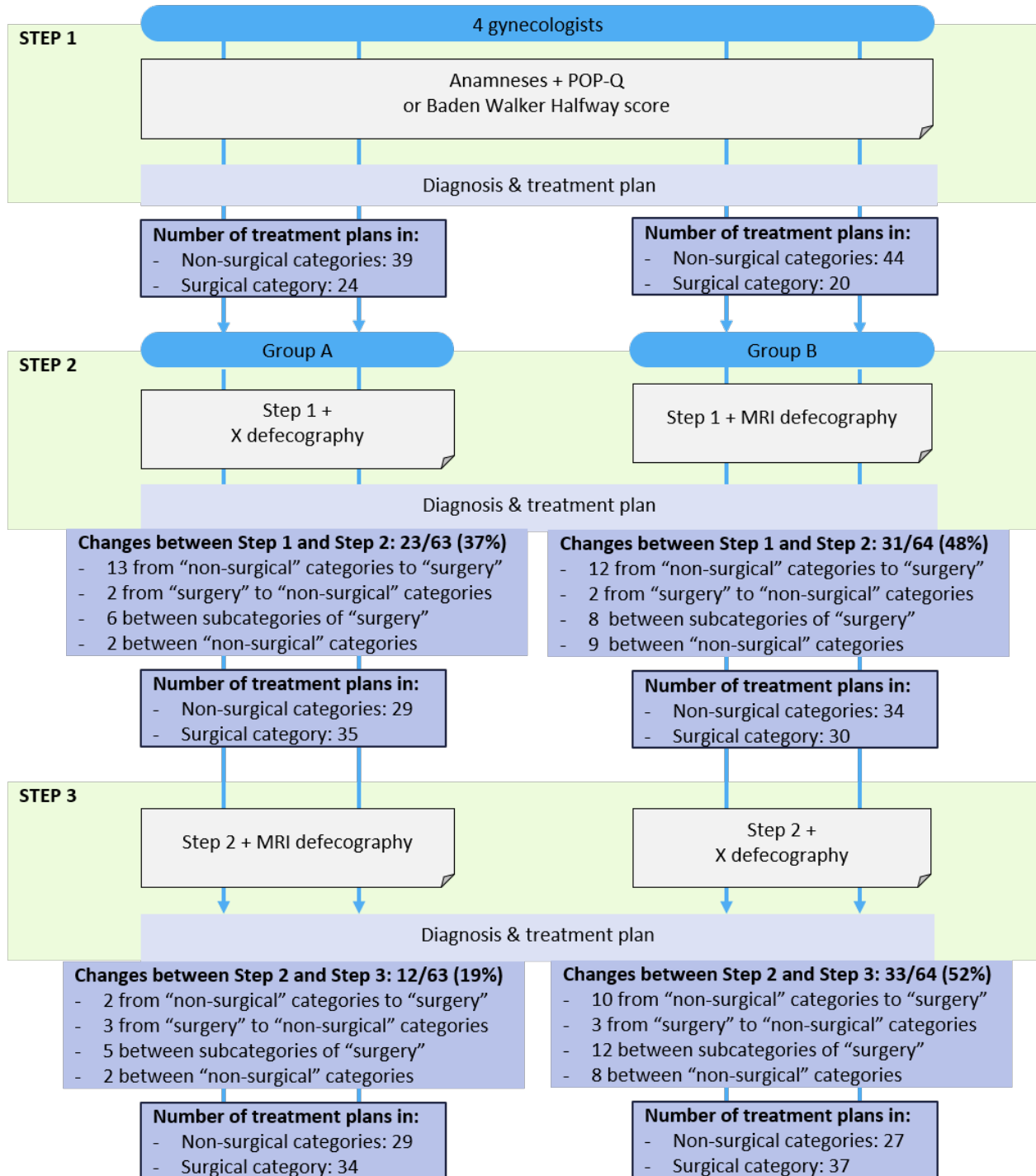


Figure 2: Changes of the treatment plan between the different steps

Table 1: Patient characteristics

Age (years): mean (SD)	60 (12.8)
Parity: number (percentage)	
1	1 (3.1%)
2	19 (59.4%)
3	5 (15.4%)
≥4	3 (9.3%)
Unknown	4 (12.5%)
POP-Q stage: number (percentage)	
Anterior	
Stage <II	13 (40.6%)
Stage II	15 (46.9%)
Stage III	4 (12.5%)
Middle	
Stage <II	21 (65.6%)
Stage II	9 (28.1%)
Stage III	2 (6.3%)
Posterior	
Stage <II	9 (28.1%)
Stage II	14 (43.8%)
Stage III	9 (28.1%)
Previous pelvic surgery: number (percentage)	23 (71.9%)
Hysterectomy	13 (40.6%)
Sacrocolpopexy	3 (9.4%)
Rectopexy	1 (3.1%)
Native tissue repair	16 (50%)
Anterior Colporrhaphy	12 (37.5%)
Posterior Colporrhaphy	15 (46.9%)
Enterocoele repair	2 (6.3%)
Sacrospinous fixation/Manchester Fothergill	5 (15.6%)

Discussion

Adding X- or MRI-defecography to the anamneses and physical examination changed the gynaecological treatment plan in respectively 37% and 48% of the patients. Adding results from the second imaging modality resulted in an additional 19% (after MR-defecography added) and 52% (after X-defecography added) change in the treatment plan.

The results of our study are in line with the hypotheses set by Groenendijk et al. [9]. They hypothesised that X-defecography has an added value for posterior compartment prolapse. Groenendijk et al. [9] additionally report that MRI-defecography has the lowest diagnostic value of the four diagnostic tests they included. They report that MRI-defecography does not provide additional information to physical examination, except for detecting enterocele and levator ani defects, which can also be detected with X-defecography. Based on these results, we hypothesised that MRI would mainly change the gynaecological treatment plan when peritoneoceles were present since these are difficult to diagnose on X-defecography because it has to be based on a unexplained widening of the rectovaginal space [10]. To test this hypothesis, we studied the added effect of MRI to peritoneoceles on the most experienced gynaecologist in group A, leading to four changed treatment plans out of six peritoneocoele patients (67%). However, the total number of patients with peritoneocoele is minimal, so no reliable conclusions can be drawn yet.

A change in the treatment plan will not always be a clinically significant change. The four categories represent the type and, therefore, invasiveness of the suggested treatment plan [11, 12, 13]. Our results show a high number of patients transferred from the non-surgical to “surgical” group. Without the added imaging, this transition might have been postponed or not been made. Striking are the numbers of withholding surgery after imaging or a different type of surgery suggested. Since surgery cannot be made undone, what is possible with a pessary [11], it is of the highest importance that both the choice for surgery and the type of surgery are made correctly. In 12.1% of the surgeries of the posterior compartment, a re-surgery of the posterior compartment is done within 20 years, with most reoperation occurring in the first year after primary surgery [14]. In 23-29% of the women get prolapse symptoms again after surgery of the posterior compartment, while the primary aim of prolapse treatments are based on reduction of symptoms [11]. A reduction in the number of recurrences after prolapse surgery might be reduced when imaging is included in the clinical decision-making process of posterior compartment complaints and surgery.

Medicine is no exact science, and we need to take this into account when interpreting our results. Looking at the gynaecologist from an individual perspective, we found a lot of variation in the cohesiveness in suggested treatment plans. One of the gynaecologists in group A favours conservative treatment as the first treatment option, leading to a minimal number of treatment plan changes resulting from the image outcomes. This most likely will have led to fewer changes in treatment plans in group A compared to group B. It is known that inter-observer variability is available in individual treatment decisions for POP [9, 15]. Additionally, in clinical practice, the patient decides whether she wants a conservative treatment or surgery.

There are some possible drawbacks to the method of this study. Firstly, we asked the gynecologists to give open answers for their treatment plan. Their answers reflect the clinical workflow, including presenting the patient with different treatment options. The answers are now retrospectively labelled with one of the four categories. A more restricted set of answers (multiple choice) would have enabled a more confined analysis. However, a disadvantage would have been that the gynecologists were limited in the treatment options (e.g. combination of pelvic floor physiotherapy and a referral to another specialism). Secondly, the treatment plans are based on the entire patient, including all symptoms and prolapse of all compartments, while in line with the research question, the classification of the (sub)categories are based on the posterior compartment. This complicated the step of classifying the treatment plans into (sub)categories. The suggested conservative treatment (e.g. ring placement because of cystocele and urinary incontinence) can be based on the non-posterior compartment, meaning a labelling “non-treatment”, while conservative treatment is described in the treatment plan. Hence, a classification in the category “no treatment” does not immediately mean that the patient does not receive any treatment but does not receive a treatment aimed at the posterior compartment prolapse. Thirdly, given the inter-observer variability and the absence of a reference standard for the treatments where the given answers can be compared, it is impossible to determine the optimal treatment for these cases and determine if the changes are correct. In clinical practice, the more complex cases are discussed in a multidisciplinary meeting to arrive a consensus about the optimal treatment. Lastly, we have assumed that a change in the treatment plan is due to the added information of the X-defecography or MR-defecography. However, the minimalisation of the memory bias can lead to an unconscious change because of intra-observer variability. Since the gynecologists do not remember the treatment plan in the previous step due to this minimalisation, a change does not have to be directly due to the added information.

There are some limitations of the data of the patient cases that can have affected the results. Firstly,

the intake is done by one of the six gynecologists of the ZGT hospital. The extent of the reporting differs a lot between the gynecologists. Additionally, the gynecologists of this study are partially the same as the gynecologists of the intake. They may recognise their own patients' cases and remember the treatments of these patients. Recognition can lead to the gynecologists already knowing more about the patient and giving the answer based on that information. However, this is only possible with a few cases of the whole data set. Secondly, X-defecography and MRI-defecography are requested in patients where the gynecologists or surgeon needs more certainty about the posterior compartment. So an X- and/or MRI-defecography is not requested for every patient with posterior POP symptoms and/or obstructed defecation. It is unknown what the added value for X- and MRI-defecography is on the clinical decision making on the treatment for all these patients. However, the used patient cases are most similar to the considerations in the current clinical care. Lastly, there are discrepancies between the X- and MRI-defecography reports, especially in reporting intussusception. With these discrepancies, the intussusception is seen on X-defecography but not in MRI-defecography, while previous studies report that MRI-defecography is reliably for diagnosing posterior compartment prolapses [4, 7, 8]. These discrepancies can affect the added value of MRI-defecography, but it is a realistic representation of the added value of the current MRI-defecography protocol of the ZGT hospital and the radiological assessment. In addition, gynaecologists have more experience in making a treatment plan based on the radiological report of X-defecography than with MRI-defecography. In clinical practice within the ZGT hospital has also been agreed that X-defecography is leading in case of discrepancies. These reasons can result in a lower added value of MRI-defecography.

This study shows the added value of imaging in the clinical decision-making process of patients with posterior compartment complaints. Since X-defecography is considered standard care in our hospital, including the preferred sitting position, lower costs and shorter waiting lists, the continuation of this imaging modality is expected as the first choice. The differences in surgical planning (type of surgery) suggest the added value of a second imaging modality in some patients. A more dedicated study to identify these patients and their symptoms should be conducted. Another interesting point is to know if imaging also has an added value for the patients who now receive surgery of the posterior compartment without a defecography before surgery or that it has only an added value when the gynecologist think to need more certainty. Lastly, it should be further investigated if the changes in the treatment plan are because of the additional defecography or the intra-observer variability by minimising the memory bias causing a conscious change by the added defecography.

In conclusion, both X-defecography and MRI-defecography show to have an effect on the treatment plan for patients with posterior compartment prolapse. Changes were made in conservative versus the surgical treatment and within surgery types. The dedicated added value of the imaging modality individually cannot be concluded yet.

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A APPENDIX - Standardised Template

Anamnese + POP-Q

Algemeen

- Leeftijd:
- Seksueel actief:
- Para *, * bevallen, * ruptuur
- BB fysio:
- Cyclus:

Voorgeschiedenis:

Hoofdklacht:

Prolapse:

- Duur:

Mictie:

- Frequentie: DM * keer, NM * keer
- Inname: Dring * per dag, * kopjes koffie
- Sterke aandrang:
- Incontinentie: * urge, * stress incontinentie
- Straal:
- Residu gevoel:
- Dysurie *, hematurie *, urineweginfecties *
- Aanvullend:

Defecatie:

- Frequentie:
- Consistentie:
- Incontinentie:
- Persen:
- Digitalisatie / steun perineum:
- Residu gevoel:
- Aanvullen:

POP-Q

Aa	Ba	C
gh	pb	TVL
Ap	Bp	D

Aanvullend LO:

TVE:

X-Defecography

Onderzoek ter vergelijking:

Rust:

Optrekken:

Valsalva:

Defecatie:

Conclusie:

- Descensus perinei:
- Residu:
- Intussusceptie:
- Rectocele:
- Enterocele:
- Fecale incontinentie:

MRI-Defecography

Conclusie:

- Cystocele: Mild/matig/ernstig
- Uterus/vaginale prolaps: Mild/matig/ernstig
- Descensus posterior: Mild/matig/ernstig
- Residu gel bij defecatie: Nee/Ja
- Intussusceptie: Nee/Ja
- Rectocele: Nee/Ja
- Enterocele: Nee/Ja
- Fecale incontinentie: Nee/Ja

Rust:

- Vulling rectumampulla:
- Anorectale hoek:
- Anorectale overgang bevindt zich * cm caudaal/craniaal van de PCL
- Positie uterus/vaginale apex: *cm caudaal/craniaal van de PCL
- Positie urineblaas: * cm caudaal/craniaal van de PCL

Optrekken:

- Anorectale hoek: *, hoek is nu *, binnen/buiten de norm
- Positie anorectale overgang: * cm caudaal/craniaal van de PCL
- Positie uterus/vaginale apex: *cm caudaal/craniaal van de PCL
- Positie urineblaas: * cm caudaal/craniaal van de PCL

Valsalva:

- Fecale incontinentie:
- Anorectale hoek:
- Positie anorectale overgang: * cm caudaal/craniaal van de PCL
- Positie uterus/vaginale apex: *cm caudaal/craniaal van de PCL
- Positie urineblaas: * cm caudaal/craniaal van de PCL
- Overig:

Defecatie:

- Residu gel bij defecatie:
- Anorectale hoek: *, binnen/buiten de norm
- Positie anorectale overgang: * cm caudaal/craniaal van de PCL
- Positie uterus/vaginale apex: *cm caudaal/craniaal van de PCL
- Positie urineblaas: * cm caudaal/craniaal van de PCL
- Intussusceptie:
- Rectocele:
- Enterocele:
- Overig: