



MR defecography technique: recommendations of the society of abdominal radiology's disease-focused panel on pelvic floor imaging

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Abstract

Purpose To develop recommendations for magnetic resonance (MR) defecography technique based on consensus of expert radiologists on the disease-focused panel of the Society of Abdominal Radiology (SAR).

Methods An extensive questionnaire was sent to a group of 20 experts from the disease-focused panel of the SAR. The questionnaire encompassed details of technique and MRI protocol used for evaluating pelvic floor disorders. 75% agreement on questionnaire responses was defined as consensus.

Results The expert panel reached consensus for 70% of the items and provided the basis of these recommendations for MR defecography technique. There was unanimous agreement that patients should receive coaching and explanation of commands used during MR defecography, the rectum should be distended with contrast agent, and that sagittal T2-weighted images should include the entire pelvis within the field of view. The panel also agreed unanimously that IV contrast should not be used for MR defecography. Additional areas of consensus ranged in agreement from 75 to 92%.

Conclusion We provide a set of consensus recommendations for MR defecography technique based on a survey of expert radiologists in the SAR pelvic floor dysfunction disease-focused panel. These recommendations can be used to develop a standardized imaging protocol.

Keywords Magnetic resonance defecography · Pelvic floor imaging · Disease-focused panel · Recommendations

Introduction

Magnetic resonance (MR) Defecography has evolved as an important tool for the evaluation of pelvic floor disorders [1]. The technique and the magnetic resonance imaging (MRI) protocol may significantly vary with institution; thus, no universally accepted guidelines are available in the United States. Recent guidelines developed by the ESUR and ESGAR [2] suggest possible variations in MR defecography technique to cater to the specific type of referring clinical specialties (e.g., urologists, urogynecologists, or proctologists), each of which may approach and manage pelvic floor disorders differently based on their perspective and expertise.

Pelvic floor disorders are often complex and involve more than one compartment [3]. The reoperation rate after initial pelvic floor surgery is approximately 29% [4]. Knowledge of defects in multiple compartments of the pelvic floor and a multidisciplinary approach to management and treatment of pelvic floor dysfunction is important to help decrease reoperation rate. A comprehensive MR defecography protocol to evaluate all compartments of the pelvic floor would thus be helpful in this regard. Furthermore, following the same protocol for all patients allows uniform quality of care, reduces errors related to the expertise or experience of technologists or radiologists, and streamlines workflow due to more predictable scan times. Guidelines for a simplified, but comprehensive, universally accepted technique irrespective of the referral specialty will allow for standardization across institutions.

The goal of this paper is to develop recommendations for MR defecography technique based on consensus of expert

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radiologists on the disease-focused panel of the Society of Abdominal Radiology (SAR).

Materials and methods

Selection of survey participants

A survey questionnaire was administered to the members of the Society of Abdominal Radiology (SAR) disease-focused panel (DFP) on pelvic floor dysfunction. Each of the SAR DFPs focuses on a particular disease or a particular aspect of a disease. Its panel members, all experts in their fields, contribute their knowledge and expertise to improve the care of patients [5].

The pelvic floor dysfunction DFP was formed in 2015 and included 20 members as of September 15, 2018. All 20 members of this DFP were included as participants for the survey. An additional brief questionnaire was also created to assess the qualification of the members included on the expert panel. It was adapted from recent guidelines published for the SAR DFP on rectal cancer [6] (see Table 1). Four criteria were used to define expertise in imaging of pelvic floor disorders [7]:

1. Publication of at least one scientific or review paper on imaging of pelvic floor disorders.
2. A minimum experience in clinical interpretation of 50 pelvic floor imaging studies.
3. Active membership in a national committee on pelvic floor disorders.
4. Active membership in an institutional multidisciplinary committee on pelvic floor disorders.

Panelists had to fulfill at least two of the criteria in order to qualify for participation in the survey.

Development of the questionnaire

The consensus guidelines provided by the European Society of Urogenital Radiology (ESUR) and the European Society of Gastrointestinal and Abdominal Radiologists (ESGAR) served as basis for development of the survey for the current study [2]. Due permission and approval were obtained. The lead author

of the European guidelines statement (RFE) also serves as a liaison between the SAR pelvic floor dysfunction DFP panel and the ESUR/ESGAR and assisted in development of this survey. In addition, an extensive review of the recent literature (January 2013–September 2018) was undertaken on PubMed and used to develop the specifics of our questionnaire.

The purpose of the questionnaire was to establish the criteria for optimal imaging technique and patient preparation. The survey consisted of 37 questions focusing on specifications of imaging equipment, imaging sequences to be acquired, and the interpretation criteria for MR defecography for assessment of pelvic floor dysfunction which often involves multiple compartments [8–11].

Of the 37 questions, 26 questions were multiple-choice questions or yes/no questions while 11 allowed free-text responses. 44 of the 11 free-text response questions were included to gather more detailed information (type of magnet, bladder preparation, quantity of contrast gel instilled in the vagina and/or rectum) on the preceding multiple-choice questions.

Data acquisition

All data were acquired from anonymous responses to the two sets of questionnaires administered to the panel of experts using an online survey tool. The first set of questions included details about the qualifications of the experts. The second set of questions included details on the patient population, the number of investigations, details on the MR scanners, and the technical aspects of the MR protocol. Both questionnaires are reproduced in Appendix Table 1. No in-person discussion was involved in the survey process to avoid possible bias and the natural tendency of participants to move toward the majority opinion [12].

Consensus for each survey question was defined as agreement of the responses by at least 75% of respondents for that question [7, 13].

Results

Total of 14 panel members responded to both parts of the survey.

Table 1 Assessment of qualification of members included on the expert panel

Criteria of expertise/qualification	Qualified panel members (%)
Publication of one or more review (scientific) paper on pelvic floor disorders	70
Minimum volume of pelvic floor cases interpreted in clinical practice	85
Serving on a national committee on pelvic floor disorders	100.00
Member of institutional multidisciplinary team on pelvic floor disorders	75

Qualifications of experts

100% of the responders qualified for at least two of the expert criteria and thus met the minimum requirement (Table 1).

Imaging survey questionnaire

Consensus agreement was achieved in approximately 70% of questions. For those items where consensus was not reached, agreement ranged from 55 to 73 %. Results for the survey questionnaire are detailed in Tables 2, 3, and 4.

The majority (85%) of the expert panelists agreed that MRI is the modality of choice for investigating pelvic floor disorders and has been integrated as the standard investigation at their institutions. A minority of institutions (15%) perform fluoroscopic defecography as their first line of investigation for pelvic floor disorders. The average annual case load for MR defecography varied between institutions:

>200 (8%), 100–200 (23%), 50–100 (31%), or less than 50 (23%).

The majority (92%) of the institutions perform their investigation on a closed configuration magnet. 46% of respondents expressed no preference for the strength of the magnet; however, 38% preferred 1.5 Tesla (T) over 3T (15%). Imaging was performed on MR systems of all major vendors.

Majority (82%) used either a body surface coil (46%) or pelvic surface coil (36%). Cardiac coil was also used at some institutions (18%).

Most (83%) of the expert panelists recommended no bowel prep or enema before the MR defecography. Although there was no consensus regarding the utility of specific pre-imaging bladder prep, the majority of respondents (67%) did not use a specific bladder prep at their institutions.

There was a 100% consensus regarding the need to coach the patient prior to the examination and explain the various commands used during the examination (squeezing,

Table 2 Items with consensus (70% or more agreement)

Question	Consensus	Frequency (%)
Investigation of choice for pelvic floor imaging	MRI	85
Is MR defecography part of the standard pelvic floor evaluation protocol?	Yes	85
Configuration of MRI (open vs. closed)	Closed	92
Preparatory enema or another bowel prep	Not recommended	83
Explanation of various commands to the patients by a qualified professional (MR technologist or radiologist)	Recommended	100
Instillation of routine vaginal gel	Not recommended	75
Instillation of routine rectal gel	Recommended	100
Simultaneous evaluation of entire pelvis	Recommended	92
Use of intravenous contrast to evaluate pelvis	Not recommended	100
Inclusion of sagittal T2W sequence of entire pelvis	Recommended	100
Inclusion of axial T2W sequence of entire pelvis	Recommended	82
Inclusion of coronal T2W sequence of entire pelvis	Recommended	82
Inclusion of axial T1W sequence of entire pelvis	Recommended	82
Inclusion of mid-sagittal balanced/T2W sequence at rest	Recommended	82
Inclusion of mid-sagittal balanced/T2W sequence during defecation	Recommended	82

Table 3 Items without consensus (less than 70% agreement)

Question	Responses
Position of patient, while instilling gel	Left decubitus (67%), right decubitus (33)
Bladder prep	Not recommended (67%), recommended (33%)
Use of diapers	Not recommended (55%), recommended (45%)
Position of patient while scanning	Supine, feet first (36%), supine, headfirst (64%)
Inclusion of axial fat-suppressed sequence for entire pelvis	Recommended (45%), not recommended (55%)
Inclusion of mid-sagittal balanced/T2W sequence during Valsalva	Recommended (64%), not recommended (36%)
Inclusion of mid-sagittal balanced/T2W sequence during squeezing	Recommended (64%), not recommended (36%)

Table 4 Use of MRI for the evaluation of pelvic floor disorder

Question	Frequency
Annual case load of MR defecography	
>200	8%
100–200	23%
50 to 100	31%
Less than 50	23%
None (mostly fluoroscopic defecography)	15%
MR vendors	
Siemens	42%
Philips	33%
GE	17%
Multiple/others	8%
Preferred strength of the magnet	
1.5 T	38%
3 T	15%
No preference	47%
Type of coil	
Body surface	46%
Pelvic	36%
Cardiac	18%
Printed material provided to the patients	
Yes	42%
No	58%
Bladder prep, if recommended	Emptying before investigation
Quantity of vaginal gel (if instilled)	10–30 cc
Quantity of rectal gel instilled	120–180 cc (majority 120 cc)
Repetition of defecatory sequence	1–3 times (three times, 55%)

bear down, or defecate). There was 100% consensus that the patient should have any questions answered by a qualified professional (MR technologist or radiologist) before the procedure was performed. About 42% of respondents indicated their use of printed or online material to explain the investigation to the patients.

The majority (75%) did not support routine instillation of ultrasound gel as contrast within the vagina. When used, typically 10–30 cc of gel was recommended. Rectal ultrasound gel was recommended to be used by 100% of the panelists. The quantity of rectal gel actually used ranged from 120 to 180 cc. There was a consensus on instilling a minimum volume of 120 cc.

Although all the panelists agreed that vaginal or rectal gel should be instilled in the decubitus position, there was no consensus about left or right lateral decubitus positioning for rectal contrast instillation. 67% recommended the left decubitus and 33% recommended the right decubitus. 100% of panelists acquired MR defecography images with patients in supine position; however, there was no consensus

Table 5 Survey questions on MR defecography sequences

Essential MR sequences (general consensus)
Sagittal T2W sequence of entire pelvis
Axial T2W sequence of entire pelvis
Coronal T2W sequence of entire pelvis
Axial T1W sequence of entire pelvis
Mid-sagittal dynamic balanced*/T2W sequence at rest
Mid-sagittal dynamic balanced*/T2W sequence during defecation
Optional MR sequences (some or no consensus)
Mid-sagittal dynamic balanced*/T2W sequence during squeezing
Mid-sagittal dynamic balanced*/T2W sequence during Valsalva
Axial T2W fat-suppressed sequence for entire pelvis

*Balanced fast field echo (bFFE), balanced turbo field echo (bTFE), true fast imaging with steady precession (TrueFISP) and FIESTA

on feet first (36%) versus headfirst (64%) placement within the scanner. There was also no consensus about the use of diapers; though 57% supported their use.

The majority (92%) of the panelists supported an evaluation of the entire pelvis along with a dedicated pelvic floor study. 100% of respondents agreed that IV contrast is not needed for these studies. With regard to specifics of the MR defecography imaging protocol and sequences (Table 5):

1. There was general consensus on the inclusion of the entire pelvis for the T2-weighted (T2W) sagittal (100%), coronal (82%), and axial (82%) sequences. The majority (82%) also agreed they should include the entire pelvis on T1W axial sequences.
2. There was consensus on acquiring mid-sagittal single-shot T2W or balanced gradient sequence such as true FISP/FIESTA/BTFE dynamic sequences at rest (82%) and during defecation (100%). The panelists reported acquiring 25–40 images in the mid-sagittal plane to generate each dynamic sequence.
3. Dynamic mid-sagittal sequences during defecation were obtained 1–3 times; the majority (55%) recommended obtaining it three times irrespective of rectal emptying as a standard protocol and others recommended repetition until rectal emptying occurred.
4. No consensus was reached on the inclusion of the entire pelvis on fat-suppressed T2W sequences, as only 46% supported it.
5. Although no consensus was reached regarding the inclusion of mid-sagittal single-shot T2W or balanced dynamic sequences during squeezing and Valsalva, it was recommended by 64 and 73% panelists, respectively.

Since responses to the additional free-text response question merits more explanation, they are described below in the discussion section. The summary of results from free-text response is as follows:

1. *What if the patient is unable to defecate?*

Experts reached consensus that additional attempts should be made before the investigation is terminated. Additional measures to improve the sensitivity of the examination are elaborated in the discussion.

2. *How can you ascertain if the patient's efforts are sufficient?*

Experts reported that evacuation of gel from the rectum, anterior motion of the abdominal wall, and distention of the femoral veins were signs of adequate patient effort.

Discussion

A comprehensive survey adapted and modified from the ESGAR guidelines questionnaire [2] administered to expert panel members of the SAR pelvic floor dysfunction DFP resulted in consensus agreement in approximately 70% of questions including those regarding MR defecography imaging protocol and sequences. For non-consensus items, agreement ranged from 55 to 73 %. At least 60% agreement in 5 out of the 7 non-consensus items indicated moderate level of agreement, but also identified areas that require more dedicated and in-depth discussion and evaluation in the future.

The experts agreed that MR defecography can be performed using closed bore magnets as has been described previously [14, 15]. It further suggests that dynamic MR imaging can be performed in supine position in a closed configuration magnet. We acknowledge that the upright position is more physiologic but it has been suggested that clinically relevant data acquired from supine dynamic MRI may not significantly differ from colpocystoproctography (conventional defecography) performed in either supine or upright position [9].

Prior studies comparing supine MR defecography to upright examinations have shown mixed results for detection and characterization of pelvic organ prolapse [16, 17]. Open MR scanners may allow a study in sitting position but are not widely available and provide poor resolution images due to low magnet field strength. Expert consensus in our study suggests that supine MR defecography in a closed magnet is an acceptable alternative. This also emphasizes the need for repeated defecation attempts in supine position to achieve complete evacuation. There was no agreement on feet first versus headfirst placement within the magnet. Theoretically, a feet first position may help claustrophobic patients by allowing more of the head and potentially upper body to be outside the magnet bore. Other authors have reported that patients can occasionally be evaluated in oblique position if they suffer from chronic spinal or back conditions [18].

There was a consensus that no bowel prep or enema is required before MR defecography [19]. When bladder prep was recommended, it just included emptying; most agreed that the bladder should either be partially emptied before the study or not emptied immediately before starting the examination so as to allow time for partial physiologic filling prior to the examination as has been described by other authors [20]. Complete bladder emptying 2 h before the study has also been described in the literature [2]. Although there are no studies assessing the effect of specific bladder volumes or time interval between voiding and the examination on MR defecography results, we suggest that patients be asked to partially empty the bladder at least 30 min before the study begins. A partially filled bladder allows for better evaluation of cystocele [20, 21]. An over-distended bladder on the other hand may completely fill the levator hiatus and thus undermine accurate assessment of middle compartmental abnormalities [22, 23].

The panelists agreed on the need for patient coaching including explaining the various commands to the patient and having a qualified professional (MR technologist or radiologist) answer any questions prior to starting the image acquisition as has been advocated by other authors previously [19]. Patients who are suffering from pelvic floor dysfunction are often anxious and may have questions about the investigation [24]. Interaction with an empathetic professional who thoroughly explains the procedure and answers any patient concerns can play a vital role in relieving their apprehension and thereby improve patient compliance and satisfaction [24]. Some institutions use printed or online materials to explain the investigation; however, the panelists did not reach a consensus on this particular issue.

There was consensus on using rectal gel, and experts recommended the use of 120–180 cc of gel which is the range described by other authors [25]. Studies have shown similar rate of successful defecation when using either 120 cc or 180 cc of rectal gel during MR defecography [26]. However, the use of vaginal gel was mostly reserved for special circumstances and was not routinely recommended. The instillation of rectal gel was performed in the lateral decubitus position on the MR table. Practically, the side (right or left decubitus) does not matter, and it can be modified according to patient need and comfort.

The use of good-quality diapers and pads has been recommended in the literature to avoid leakage (perhaps then leading to electrical hazards or damage to the instrument) [19]. Although the expert panel did not reach consensus, 57% of panelists did support the use of diapers.

MRI protocol

There was agreement that the MR imaging should not be confined to small field of view images of the pelvic floor,

but rather should include the entire pelvis. Performing a non-contrast pelvic MRI including the entire pelvis on T1W/T2W sequences allows for a diagnosis of incidental findings. The panel consensus indicated the inclusion of a T1W/T2W axial, and T2W coronal and sagittal images of the entire pelvis, and dynamic evaluation of the pelvic floor at rest and defecation. These sequences have been described as part of standardized MR defecography protocols previously [25, 27, 28]. Of note, no consensus was reached regarding the need to acquire dynamic sequences of the pelvic floor during squeezing and Valsalva maneuver.

The defecatory phase was repeated 1–3 times by most of the experts with majority experts recommending acquiring it at least three times. Studies have shown that dynamic imaging during the defecation phase yields important information on the presence and degree of pelvic floor abnormalities [29, 30]. Pelvic floor abnormalities can be underestimated (or even appear normal) on the straining phase (the Valsalva maneuver). Repetition of the straining and/or defecation, however, may reveal otherwise undetected pelvic floor abnormalities [8, 31].

MR Defecography protocol developed based on the survey consensus and recommended by the SAR pelvic floor DFP is detailed in Table 6 and also available on the DFP's website (<https://www.abdominalradiology.org/general/custom.asp?page=DFPpelvicfloor>).

Additional sequences that were recommended by some of the experts (but did not achieve consensus) included T2W axial and coronal oblique images at rest for the urethral

support system in the case of stress urinary incontinence. Some experts suggested performing the examination in two phases, one with a filled bladder for the cystographic phase, and the second with an empty bladder for a defecography phase. This has been previously described for fluoroscopic defecography [32, 33].

Free response questions

Inability to defecate

The free-text response question, “*What if the patient is unable to defecate?*” was asked of the panelists.

Inability to defecate or retention of rectal content despite voluntary efforts may indicate a diagnosis of dyssynergia (functional defecation disorder due to inability to relax external sphincter or paradoxical contraction of puborectalis) [34–36]. However, sometimes the patient is unable to void due to *awkwardness* or simply anxiety or apprehension [37]. It is important to distinguish between the two entities, as dyssynergia can be managed non-surgically with biofeedback [38].

Experts had a recommendation that additional attempts should be made in such circumstances and the study should not be terminated without making at least three attempts. In addition, the experts also recommended the following measures:

1. Increase the quantity of the rectal gel. Additional intraluminal gel may distend the rectum and provoke a physi-

Table 6 Recommended MRI protocol

Plane	Technique	Angulation/axis	Thickness/ spacing (mm)	FOV (mm)	#Slices
Sagittal	T2W turbo/FSE	Straight, parallel to sagittal plane	5/1	240	24–30
Axial	T2W turbo/FSE	Straight, perpendicular to longitudinal axis	5/1	240	32
Coronal	T2W turbo/FSE	Straight, parallel to frontal plane	5/1	240	30
Axial	T1W SE/GRE	Straight, perpendicular to longitudinal axis	5/1	300	Variable
Mid-sagittal dynamic, rest	b-FFE/true FISP/ bTFE*	Mid-sagittal	7–10	320	Single slice cine
Mid-sagittal dynamic, defecation**	b-FFE/true FISP/ bTFE*	Mid-sagittal	7–10	300–340	Single slice cine mode
Mid-sagittal dynamic, squeezing	b-FFE/true FISP/ bTFE*	Mid-sagittal	7–10	320	Single slice cine mode
Mid-sagittal dynamic, Valsalva	b-FFE/true FISP/ bTFE*	Mid-sagittal	7–10	320	Single slice cine mode

FOV field of view

*Balanced steady state acquisition

**Repeated at least three times; FOV should ideally include proximal thigh

ological response and neurological reflexes that initiate the defecatory process.

2. Counsel and try again: A discussion with the patient to explain the importance of the defecatory phase for making an accurate diagnosis and then rescan.
3. If these measures fail, patient should be instructed to use the bathroom and evacuate. Rescanning can be performed using sagittal T2W or steady-state cine sequences during maximal Valsalva to assess retention and prolapse that may have been masked by a distended rectum. Sending the patient to the rest room may alleviate the patient's apprehension and social anxiety.

Are patient efforts sufficient?

Another free response question, “*How can you ascertain if the patient's efforts are sufficient?*” was asked of the panelists. Despite a comprehensive discussion and full explanation of commands, it is not uncommon that some patients do not understand or are unable to follow the commands, and cannot provide sufficient effort [39]. As mentioned above, underperformance of patient effort and the inability to appropriately defecate may also mask pelvic floor abnormalities.

The experts demonstrated their agreement that talking to the patient on the scanner may resolve these issues in most cases. The MR technologist plays a crucial role in this communication. Additional observation and practice pearls from the experts included:

1. Observing the anterior abdominal wall and its movement can provide a subjective assessment of patient's effort [36].
2. Scanning through the groin and observing the size and shape of the femoral veins may be beneficial. The veins may engorge and increase in size with Valsalva or bearing down [24].
3. Evacuation of gel is a reliable sign of a patient's effort.

This questionnaire was a simplified version of a previously published European study [2]. It would not have been feasible to significantly increase the number of survey questions without decreasing the response rate. For example, the survey did not include questions on reporting of MR defecography. However, a template of report approved by all members of DFP has already been published online and included as Appendix 2. The survey was distributed to an existing 20 members of the disease-focused panel on the Society of Abdominal Radiology, which included experts in ultrasound, MR, and fluoroscopic evaluation of the pelvic floor. However, the questionnaire was focused on MR defecography application and technique, and thus, the number of responders dropped to 14 out of 20 due to a lack of

expertise. Most of the responders were practicing tertiary level teaching and/or at university hospitals, and their patient population and case load may thus not be generalizable to smaller community hospitals and/or private practices. In addition, pelvic floor imaging experts at other centers that were not part of the DFP were not surveyed. The expertise of the responder was assessed based on the questionnaire; however, it did not include the duration and span of the practice with regard to pelvic floor imaging, and the details of case load in actual clinical practice. Inclusion of the free-text response questions made the responses and assessments more subjective. Finally, the survey expert panel did not include non-radiologists. Given the varied types of referring physicians who treat patients with pelvic floor dysfunction (urologists, urogynecologists, colorectal surgeons, gastroenterologists, etc), it is possible that there would be lower level of consensus in such a heterogeneous panel. Nonetheless, crosstalk between specialties that diagnose and manage conditions of the pelvic floor is needed to improve patient outcomes. To this end, a larger scale collaboration is underway in the form of the Pelvic Floor Consortium, a multidisciplinary group including radiologists and non-radiologists, to try to develop guidelines regarding clinical indications, technique, and interpretation of various imaging modalities of the pelvic floor. Results of that work are expected to be reported in the near future.

In conclusion, we provide a set of consensus recommendations for MR defecography technique based on a survey of expert radiologists in the SAR pelvic floor dysfunction disease-focused panel. We propose an consensus imaging protocol based on our findings and describe additional optional techniques that may be employed and modifications that may be made based on local needs of different institutions. Our consensus recommendations can provide a starting point for more comprehensive discussion between radiologists and non-radiologists to improve imaging and care of patients with pelvic floor dysfunction.

Disclosure None.

Compliance with Ethical Standard

Conflict of interest All authors declare that they have no conflict of interest.

Ethical Standard No IRB approval was required.

Appendix 1

See Appendix Table 7.

Table 7 Questionnaire

S. no	Question	Options/answers
1.	What is the investigation of choice for pelvic floor imaging in your hospital?	1. MR defecography 2. Fluoro defecography
2.	Is MRI defecography part of the standard pelvic floor evaluation in your hospital?	1. Yes 2. No
3.	How many patients are evaluated with MR defecography in your hospital annually?	Provide number
4.	What is the preferred field strength of magnet?	1.5T, 3T, No preference
5.	Please specify your system	–
6.	Please specify configuration of magnet	1. Open, 2. Closed, 3. Both
7.	What kind of coil do you use?	Body surface, Pelvic, Cardiac
8.	Do you recommend cleansing preparatory enema or any other bowel preparation?	1. Yes 2. No
9.	Do you recommend any bladder preparation?	1. Yes 2. No
10.	Please specify bladder preparation, if recommended	–
11.	Does a radiologist or technologist explain the commands (squeeze/bear down/defecate) and answer the questions for the patient?	1. Yes 2. No
12.	Do you provide any printed or online material to explain the investigation?	1. Yes 2. No
13.	Do you routinely instill vaginal gel?	1. Yes 2. No
14.	If yes, please specify quantity	–
15.	Do you routinely apply rectal filling?	1. Yes 2. No
16.	If yes, please specify quantity	–
17.	Do you simultaneously evaluate the entire pelvis?	1. Yes 2. No
18.	If yes, do you use IV contrast?	1. Yes 2. No
19.	What is the position of the patient while instilling rectal or vaginal filling?	Right decubitus, Left decubitus, Supine, Prone
20.	What is the position of the patient while scanning?	Supine, feet first; Supine, head first; On side, feet first; On side, head first
<i>Name the MR sequences routinely included in protocol</i>		
21.	Sagittal T2-weighted sequence, entire pelvis	1. Yes 2. No
22.	Axial T2-weighted sequence, entire pelvis	1. Yes 2. No
23.	Coronal T2-weighted sequence, entire pelvis	1. Yes 2. No
24.	Coronal T2-weighted sequence, entire pelvis	1. Yes 2. No
25.	Axial T1-weighted sequence, entire pelvis	1. Yes 2. No
26.	Axial fat-suppressed T2-weighted sequence, entire pelvis	1. Yes 2. No
27.	mid-sagittal single-shot T2-weighted (or balanced) sequence, at rest	1. Yes 2. No
28.	mid-sagittal single-shot T2-weighted (or balanced) sequence, squeezing	1. Yes 2. No
29.	mid-sagittal single-shot T2-weighted (or balanced) sequence, Valsalva	1. Yes 2. No
30.	mid-sagittal single-shot T2-weighted (or balanced) sequence, defecation	1. Yes 2. No
31.	Please provide details of mid-sagittal single-shot/balanced (T2-weighted) sequence	FOV, Slice thickness, Matrix, TR, TE
32.	How many times mid-sagittal single-shot T2-weighted sequences are repeated at the same slice position during squeezing/Valsalva/defecation?	–
33.	Do you use any additional sequence?	–
34.	How many times is the defecatory sequence attempted?	–
35.	What if the patient is unable to defecate?	–
36.	How can you ascertain if the patient's efforts are sufficient?	–
37.	Any additional inputs?	–

Appendix 2: Template of report

Exam: MRI defecography (pelvis) W/O IV contrast

HISTORY: [] years old [female/male] with []

TECHNIQUE: [] cc of ultrasound gel was instilled into the rectum. Multiplanar MRI of the pelvis was performed utilizing [enter specific protocol]. All images were obtained with patient in [supine/upright/other] position.

IV Contrast: None

COMPARISON: [Any prior study used for comparison]

FINDINGS:

Anatomic Evaluation: [Report anatomic findings including pertinent surgical changes (hysterectomy), urethral slings, vaginal mesh, urethral bulking agent. Discuss appearance of levator anatomy]

Functional Evaluation:

Patient [did/did not] defecate adequately during the examination.

Landmark used for evaluation of prolapse: Pubococcygeal line

H line (levator hiatus)

Rest: [] cm (normal ≤ 5 cm).

Defecation/Maximal strain: [] cm.

M line (anorectal junction location relative to PCL)

Rest: [] cm [above/below] (normal ≤ 2 cm below).

Defecation/Maximal strain: [] cm [above/below]

Above findings are consistent with [normal/widened] levator hiatus and [normal/low lying] anorectal junction at rest with [no/grade1/grade2/grade3] widening and [no/grade1/grade2/grade3] descent during defecation/maximal strain.

Anterior Compartment

Bladder base location relative to the PCL:

Rest: [] cm [above/below]

Defecation/Maximal strain: [] cm [above/below]

Findings are consistent with [no/grade1/grade2/grade3] cystocele.

Urethral hypermobility: [present/absent]

Middle Compartment

[Vaginal apex/cervix] location relative to PCL:

Rest: [] cm [above/below]

Defecation/Maximal strain: [] cm [above/below]

This is consistent with [no/grade1/grade2/grade3] vaginal prolapse.

Posterior Compartment

[Anorectal] angle

Rest: [] degrees; Kegel: [] degrees; Defecation/Maximal strain: [] degrees.

Findings consistent with [normal/narrowed/widened] resting angle [with/without] expected narrowing during Kegel and [expected widening/paradoxical contraction] during defecation/maximal strain.

Rectal Intussusception: [present/not present]

[If present – full thickness vs. partial thickness.

If full thickness, provide level – intra-rectal, intra-anal, or extra-anal prolapse].

Rectocele: [Present/Absent]

Rectocele size: [] cm AP.

Findings are consistent with [no/grade1/grade2/grade3] rectocele

Peritoneocele/Enterocele/Sigmoidocele: [Present/Absent]

Distance below PCL: [] cm.

Findings are consistent with [no/grade1/grade2/grade3] [peritoneocele/enterocele/sigmoidocele].

Other: [Incidental findings as appropriate].

IMPRESSION:

1. Anatomic findings
2. Anterior compartment findings
3. Middle compartment findings
4. Posterior compartment findings


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