Defecating proctography: suggested technique and spectrum of findings

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Learning objectives

The aim of this educational exhibit is to present a suggested technique for performing fluoroscopic defecating proctography and demonstrate the range of pathological findings commonly encountered to assist in performing and interpreting the procedure.
Background

Fluoroscopic defecating proctography (also referred to as defecography, barium defecography, evacuation proctography, dynamic proctography and voiding proctography) is a well-established, practical and cost-effective method for dynamic evaluation of defecation [1-3]. The findings often guide management and lead to significant improvement in what can be debilitating and embarrassing symptoms, however the procedure is typically only offered in a small number of metropolitan centres in Australia.

The principle reason for referral for defecating proctography is disordered defecation, which encompasses a number of possible symptoms such as constipation, incomplete defecation, obstructed defecation, prolapse and incontinence. In general, risk factors for disordered defecation include [1-3]:

- Female
- Multiparity (including traumatic delivery)
- Advanced age
- Chronic constipation
- Irritable bowel syndrome

While fluoroscopic defecating proctography with barium contrast offers unsurpassed dynamic assessment of defecation, magnetic resonance imaging (MRI) offers superior anatomical definition of muscular structures [2, 3]. However, standard MRI examinations are performed with the patient lying supine, which is not the typical position of defecation and therefore not suitable for investigating defecatory disorders. Specialised MRI rooms can be equipped to allow imaging in the sitting or upright positions, but this can be particularly costly and has not yet demonstrated diagnostic superiority to the fluoroscopic technique [2, 3].

Suggested technique (as used at Alfred Health, Melbourne, Australia)

Before undergoing fluoroscopic defecating proctography, patients are requested to complete full bowel preparation. Upon arrival to the radiology department, informed consent and further relevant medical history are obtained from the patient by the radiology registrar or consultant performing the procedure. As many patients find defecating
proctography an embarrassing and unpleasant test, utmost care must be taken to ensure the procedure has been described in full. Prior to commencement, all members of the involved team should be introduced and staff numbers kept to the minimum required. Clear instructions should be given to the patient at each step of the process with allowance at any time to pause or end the procedure at the patient's discretion.

1. With the patient lying on the procedure table, preliminary x-ray fluoroscopic images are taken of the pelvis in posterior-anterior (PA) and true lateral with the knees bent.

2. For female patients, a large urinary catheter is inserted into the vagina, with care taken to orientate the tube posteriorly along the vaginal wall, away from the urethral meatus. Liquid barium contrast is then injected along the posterior wall of the vagina.

3. Digital rectal examination is performed, followed by insertion of a rectal tube. The rectum is then filled with 60 mL of liquid barium and 180 mL of "neostool" material (3 scoops of breadcrumbs and 3 scoops of barium powder mixed with warm water to 180 mL). It is important to ensure the consistency of the neostool resembles normal soft stool, as firmer material may be difficult to evacuate and runny material may be difficult to hold in.

4. The skin of the anus is marked with a small amount of liquid barium to ensure it can be identified on fluoroscopic images.

5. The patient moves to sit on the commode (also called the "throne") and the fluoroscopic machine is adjusted to take lateral images of the seated patient.

6. Upon instruction, the patient then defecates while fluoroscopic screening is performed.

7. After defecation, the patient is allowed privacy, preferably in a separate bathroom, to clean up before returning to the fluoroscopic table for two post evacuation images (PA and lateral).

Assessing movement of the pelvic floor with 'bearing up' (voluntary contraction) and 'bearing down' (straining) is an important component of defecating proctography [1], however this can often be challenging for patients to conceptualise, leading to confusion and longer than necessary screening times. One way to assist is to ask the patient to visualise scenarios in order to perform the required pelvic floor movements. For example:

- "Scenario 1: imagine you are out shopping and need to open your bowels, but there is no toilet in sight. Pull up on your pelvic floor to hold everything in!"
- "Scenario 2: imagine you finally find a toilet! Strain like you're trying to poo but don't let anything out."

Several authors use oral small bowel contrast [1-4] and a smaller number use intravesical (bladder) contrast [2] as part of the standard technique. Whilst not employed at our
institution, opacification of the small bowel and urinary bladder increase the diagnostic sensitivity of the examination for pelvic enterocoele and cystocoele, respectively, and should be considered if indicated in conjunction with the added preparation and invasiveness burden.

**Radiation dose:**

Defecating proctography has historically been considered a fluoroscopic procedure yielding a relatively high radiation dose, largely due to the comparatively long screening times needed during defecation as well as reliance on the lateral projection [5].

Table 1 summarises the median dose length product (DAP) as well as the 10th, 25th, 75th and 90th centile DAP data for our institution since 2014.

**Normal examples:**

Figure 1 demonstrates the normal static findings in a male patient. Assessment of the anorectal angle is important in evaluating the function of the puborectalis sling during straining and voluntary contraction [6]. The angle should be similar in both males and females [6]. Figure 2 demonstrates the normal movement of the pelvic floor during evacuation in a female patient.

**Common pitfall**

A relatively common pitfall is inadvertent catheterisation of the bladder which usually occurs during an attempt to opacify the vagina with contrast (Figure 3). As this procedure is performed with a non-sterile technique, there is a risk of developing a urinary tract infection. Should bladder catheterisation occur, patients are instructed to hydrate and void as often as possible over the proceeding 24 hours and are given a script for a short course of prophylactic oral antibiotics (usually cephalexin). It is also suggested that patients seek advice from their local GP should they experience any signs or symptoms of a urinary tract infection in the coming days/weeks.
**Table 1**: DAP for Defecating Proctogram. (*With thanks to Kyle Ewert, Diagnostic Imaging Medical Physicist | Alfred Radiology and Nuclear Medicine Department)

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Fig. 1: Figure 1 - normal static findings in a male patient a. In the neutral position, the puborectalis muscle impression on the posterior anorectal junction creates the normal anorectal angle(*). b. During voluntary contraction of the pelvic floor, the anorectal angle decreases. c. During straining, the anorectal angle increases and there is descent of the pelvic floor. d. Post evacuation the pelvic floor returns to the neutral position.

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Fig. 2: Figure 2 - normal movement of the pelvic floor during evacuation in a female patient. Sequential still images during normal evacuation in a female patient. There is descent of the pelvic floor with obliteration of the puborectalis impression (*). A sliver of contrast can be seen within the vagina which closely opposes the anterior rectal wall throughout (arrow). Artefact from the wooden commode (‘throne’) is seen inferiorly.

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**Fig. 3:** Figure 3 - Contrast is seen opacifying the bladder (arrow) after inadvertent catheterisation during the attempt to opacify the vagina.

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Pathological findings

Rectocoele

A rectocoele is an outpouching of the rectal wall. The majority of these are in the anterior direction, bulging into the posterior wall of the vagina. It is a very common finding on proctography, seen in over 75% of women who have given birth [2]. Risk factors include increasing parity, vaginal deliveries, advanced age, and high BMI [7].

Small rectoceles less than 2 cm in depth (measured relative to the anterior anal margin) are considered a normal finding, whereas a rectocoele above 3.5 cm in depth is considered large [2]. Rectoceles can be seen throughout the process of defecation, however are most obvious in the early and mid-stages (see Figure 4 - anterior rectocoele and recto-rectal intussusception).

A rectocoele may present with symptoms of incomplete emptying or the need for frequent defecation [4]. This is due to retained material within the rectocoele being released into the rectal ampulla at the conclusion of defecation.

Enterocoele

An enterocoele is herniation of small bowel loops into the rectogenital space [4]. This is best seen if the small bowel is opacified with oral barium contrast, however can be inferred by the presence of gas-filled small bowel loops between the opacified posterior vaginal and anterior rectal walls (see Figure 5 - enterocoele).

Though less common than rectoceles, enteroceles are a common entity, seen in approximately 28% of examinations [8]. Enteroceles are best seen at the end of defecation when the space they fill is no longer occupied by distended rectum.

The main risk factor for enterocoele is previous hysterectomy [2, 9]. The significance of enterocoele is unclear, with some evidence suggesting it does not result in obstructed defecation [10].

Sigmoidocoele
Sigmoidocoele refers to prolapse of redundant sigmoid colon into the rectogenital space, seen in approximately 5% of examinations [8]. This is an important condition to diagnose on proctography as it is typically not able to be detected clinically and can lead to constipation [8]. Symptoms can typically be resolved with surgical repair [2].

A sigmoidocoele is easily seen if the sigmoid is adequately opacified (see Figure 6 - sigmoidocoele, anterior rectocele, uterine prolapse and anal prolapse), however the presence of gas-filled loops of large bowel protruding into the rectovaginal space is highly suggestive.

**Cystocele**

Cystocele refers to the abnormal descent of the urinary bladder posteroinferiorly into the anterior vaginal wall. Cystoceles are an incidental finding on proctography, as they typically do not produce symptoms related to defecation, but rather produce urinary symptoms of voiding dysfunction [2].

On an uncomplicated proctogram, a cystocele will not be seen directly, but can be inferred by the posteroinferior displacement of the opacified vagina (see Figure 7 - cystocele without intravesical contrast). However, if contrast has been inadvertently or intentionally introduced into the urinary bladder, a cystocele will be more clearly visible.

**Intussusception and Prolapse**

Intussusception involves circular infolding of the rectal wall into the lumen associated with straining (Figure 4). It usually begins at 6-8 cm above the anal canal and ranges from minimal infolding of the wall (with anything > 3 mm considered abnormal) to circular invagination of all three layers of the rectal wall and formation of a pocket filling the rectal ampulla. In the latter case the descended rectal wall can plug the lumen and obstruct passage of any further stool.

Patients may complain of difficulty emptying, pain, spotting of blood or mucous discharge.

Intussusception may be intra-rectal (remains within the rectum), intra-anal (reaches into the anal canal) or extra-anal (reaches through the anal canal and prolapses).

With rectal or anal prolapse the anal canal dilates to accommodate as all three layers of the rectal wall descend beyond the anal verge resulting in extra-anal intussusception, or, external prolapse (Figure 6). Symptoms associated with rectal prolapse include chronic blockage, tenesmus, haematochezia and incontinence. As the anterior peritoneum is
pulled caudally during intussusception, a concomitant finding may be the presence of an enterocoele [1-3].

**Incomplete emptying**

Following adequate attempts at defecation the examiner should comment on the completeness of emptying of the rectum. The degree of incomplete emptying is a subjective assessment with no formal grading method described in published literature, with some radiologists just objectively reporting presence or absence of any residual contrast material within the rectum at the end of the procedure. The patient should also be questioned as to whether or not they feel complete emptying has taken place, ensuring the fluoroscopic monitor is not visible by the patient during the procedure so as not to bias their response [1-3]. See Figure 8 for visualisation of anismus and incomplete defecation.

**Anismus**

Anismus refers to a functional abnormality involving inappropriate, involuntary and paradoxical contraction of pelvic floor muscles during evacuation. There are several synonymous terms for the condition including pelvic floor dyssynergy and paradoxical puborectalis contraction. Patients typically report constipation and incomplete emptying. Defecating proctography may demonstrate prolonged (evacuation time of > 30 seconds) and incomplete evacuation of contrast material (Figure 8). In patients with the appropriate clinical history these findings give a positive predictive value of 90%. Other radiological findings can include a lack of pelvic floor descent or paradoxical contraction of the puborectalis muscle, as well as failure of the anorectal angle to open during defecation. A final additional finding may be a hypertrophic puborectalis muscle however this can be seen in asymptomatic patients [2, 3].
Images for this section:

**Fig. 4:** Figure 4 - anterior rectocele and recto-rectal intussusception

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**Fig. 5:** Figure 5 - enterocoele demonstrated by aerated loops of small bowel descending and impressing on the rectum.

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Fig. 6: Figure 6 - sigmoidocoele, anterior rectocoele, uterine prolapse and anal prolapse.

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Fig. 7: Figure 7 - cystocele without intravesical contrast in a female patient with vaginal contrast, seen as impression of the posterior bladder wall and vagina on the anterior rectum.

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**Fig. 8:** Figure 8 - anismus with incomplete emptying. Note the posterior indentation of the hypertrophied puborectalis muscle.

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Conclusion

This educational exhibit presented a suggested technique for performing defecating proctography and a pictorial series of the frequently encountered pathological findings. This procedure, despite typically being offered in only a small number of metropolitan centres, can potentially provide findings that guide management and lead to significant symptomatic improvement.
Personal information


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References


