Anorectal function testing

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Abstract

Faecal incontinence and evacuation disorders are common conditions that cause significant morbidity. Patient-reported symptoms are poor predictors of underlying pathophysiology, so anorectal function testing is a key component of the clinical evaluation when initial management strategies fail. A number of investigations are available to assess anorectal structure (endoanal ultrasound, defaecography) and function (anorectal manometry, rectal sensory test, balloon expulsion test, defaecography). This review article outlines the usefulness and relevance of these investigations for the investigation of patients with faecal incontinence and/or evacuatory difficulty.

Keywords Anorectal function testing; anorectal manometry; balloon expulsion test; endoanal ultrasound; evacuation disorder; faecal incontinence; MRCP; rectal sensory test

Key points

- Testing of anorectal function and structure is indicated to investigate patients with faecal incontinence and/or an evacuation disorder who do not respond to conservative therapies
- Owing to the complex nature of continence and evacuation, a number of investigations are required to assess not only the structure, but also the motor and sensory function of the anorectum
- Because there is an overlap of findings between health and disease, results should be interpreted in the context of the patient's symptomatology, which is best done in a multidisciplinary setting

Introduction

Faecal continence and evacuation is a complex process that requires the intact sensory and motor function of the colon, rectum and anus.[1] Dysregulation of any part of this process can lead to faecal incontinence and/or evacuatory difficulty.[2] Such anorectal dysfunction is common, and population studies indicate that faecal incontinence affects approximately 8% of the community-dwelling population. Evacuation disorders are even more prevalent (up to 14% of individuals), and both have been shown to significantly adversely affect quality of life and social functioning.

Most patients presenting with such symptoms are managed in the primary care setting with interventions aimed at modifying diet, lifestyle and stool consistency. However, individuals who do not respond to such treatment require onward referral to a tertiary centre for specialist investigation and management.[3] Clinical assessment then focuses on elucidating: (1) symptom type and severity (nature and frequency of symptoms); (2) aetiological risk factors (obstetric injury, anorectal surgery, benign anorectal disease, diabetes mellitus, obesity, stroke); and (3) physiological biomarkers for triage to onward management (with clinical examination and anorectal function or structure testing).[2]

The choice of investigations is typically guided by local resources as well as the clinical history and examination.[4] Of particular importance is that, because of the multifactorial nature of symptom development, no single test can fully characterize function, so investigations are typically performed in a complementary manner. A number of tests of structure and function are available; a thorough review of all these is, however, beyond the scope of this article so only the most commonly encountered investigations (anorectal manometry, rectal sensory test, endoanal ultrasound, balloon expulsion test, defaecography) are described below.

Anorectal manometry

Anorectal manometry is the most commonly performed investigation of anorectal function. It consists of recording intraluminal pressures from the anus and the rectum at rest, during a series of predefined manoeuvres (squeeze, push, cough) and during rectal distension (to provoke the rectoanal inhibitory reflex).[4] Equipment can measure pressure from single points in the anal canal (conventional manometry) or simultaneously from multiple points (high-resolution manometry). Although the technique is in its relative infancy, emerging data suggest that high-resolution manometry offers better diagnostic accuracy than conventional manometry.

Manometry is typically used to quantify:

- anal tone and contractility – anal hypotonia (reduced anal pressures at rest) and hypocontractility (reduced anal pressures during squeeze) both being associated with faecal incontinence (Figure 1)
- rectoanal coordination – inadequate propulsion (failure to increase rectal pressure during straining) and dyssynergia (paradoxical anal contraction during straining) both being associated with evacuation disorders.

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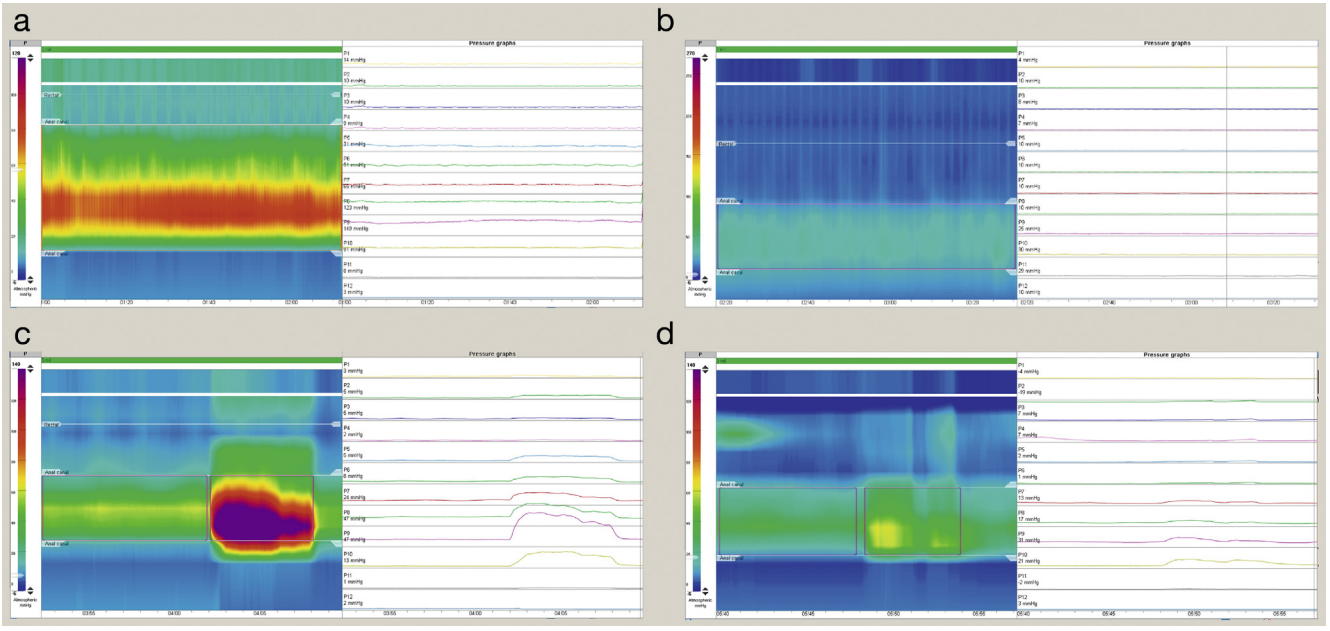

Figure 1 High-resolution anorectal manometry. Representative high-resolution anorectal manometry images and line traces: (a) normal anal tone at rest; (b) anal hypotonia; (c) normal anal squeeze; and (d) anal hypocontractility.

The results can be used to guide biofeedback therapy. It should be noted, however, that there is significant debate over the usefulness of the results (particularly manometric measures of rectoanal coordination) as there is significant overlap in findings between health and disease.[5] For this reason, anorectal manometry should be paired with at least one other test of evacuation.

Rectal sensory test

The rectal sensory test involves insufflation of an intra-rectal balloon to assess rectal sensation to distension, and is considered an integral part of anorectal function testing.[4] The following thresholds are typically reported: (1) volume at first constant sensation; (2) volume at desire to defaecate; and (3) maximum tolerated volume. A patient is generally considered to have an abnormality of rectal sensation if two out of three volumes are either above or below the lower limit of normal.

Rectal hypersensitivity (heightened sensation) is commonly demonstrated in patients with irritable bowel syndrome with predominant diarrhoea (IBS-D), faecal urgency and urge faecal incontinence, and may be related to reduced rectal compliance, reduced capacity or an exaggerated response to distension. Such patients may respond to biofeedback and pharmacological therapy with agents such as loperamide or amitriptyline. Rectal hyposensitivity is typically associated with constipation and/or overflow incontinence, megarectum or neurological dysfunction, and may predict a poor response to treatment with biofeedback and bowel retraining.

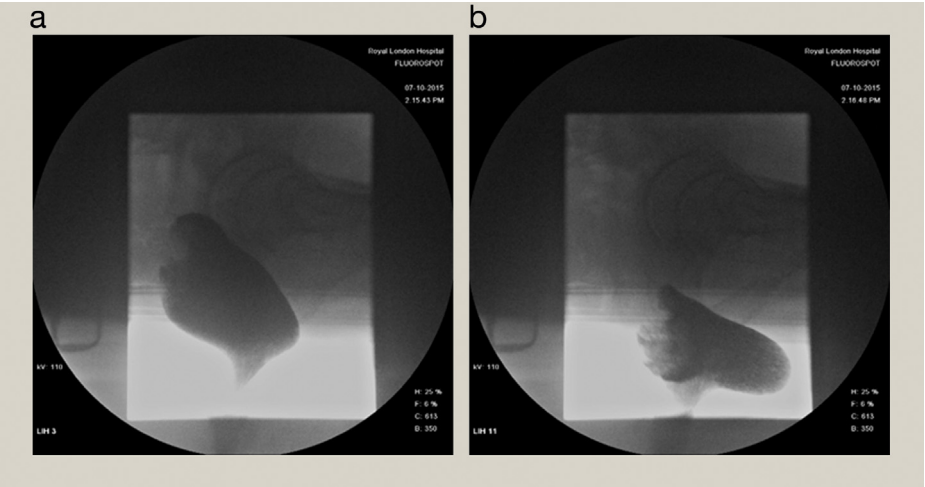

Figure 2 Defaecography. Representative defaecography images: (a) normal view at rest; (b) large rectocele bulging anteriorly on an attempt at evacuation.

Endoanal ultrasound

Endoanal ultrasound is considered the gold standard for the delineation of anal sphincter anatomy. It is a simple and well-tolerated technique with the ability to exquisitely demonstrate anatomical abnormalities of the internal and external anal sphincters. It is generally indicated to evaluate sphincter anatomy in patients with faecal incontinence. It is also used to assess obstetric anal sphincter injury after childbirth, to guide sphincter repair and assist in planning subsequent deliveries.

Internal anal sphincter defects or degenerations are commonly seen in patients with passive faecal incontinence, whereas internal anal sphincter hypertrophy is a hallmark of rectal intussusception (infolding of the rectal mucosa) and prolapse. External anal sphincter defects and atrophy are commonly associated with anal hypocontractility and are seen in two-thirds of patients with faecal incontinence.[4]

Balloon expulsion test

The balloon expulsion test is a screening investigation to assess evacuation.[4] A flexible catheter with a compliant balloon at the tip is placed inside the rectum, the balloon is filled with 50 ml of warm water, and the patient is instructed to expel the balloon while sitting in privacy on a commode. Success or failure to expel the balloon within 2 minutes is then recorded. Although this test has excellent specificity, it is poor in discriminating between mechanical and functional causes of evacuatory difficulty. If further treatment based on an abnormal result is planned, further investigation with defaecography should be considered essential.

Defaecography

Evacuation proctography (using barium and fluoroscopy) and magnetic resonance defaecography are considered to be gold

Clinical relevance of findings of anorectal function tests

Structure	Function	Investigation	Finding	Significance
Anus	Motor	Anorectal manometry	Anal hypotonia	***
			Anal hypertonia	**
			Anal hypocontractility	***
	Structure	Endoanal ultrasound[a]	IAS defect	***
			IAS degeneration/atrophy	**
			IAS hypertrophy	**
			EAS atrophy	**
			EAS defect	***
Rectum	Sensory	Balloon distension	Rectal hypersensitivity	***
			Rectal hyposensitivity	***
Anorectal unit	Motor	Balloon expulsion	Prolonged	***
	Motor/sensory	Anorectal manometry[b]	Coordination	
	Motor/sensory/structure	Defaecography (barium/MRI)	Poor propulsion with dyssynergia[b]	**
			Normal propulsion with dyssynergia[b]	**
			Reflex	
			Anorectal areflexia[c]	***
			Structure	
			Obstructing intussusception	***
			Retaining rectocele	***
			Megarectum	*
			Rectal prolapse	***
			Enterocele/sigmoidocele	**
			Cystocele	**
			Vaginal vault prolapse	**
			Excessive perineal descent	**
			Function	**
			Impaired rectal emptying	***
			Impaired anorectal angle opening	**

*Finding of questionable clinical significance.
**Finding of minor clinical significance.
***Finding of major clinical significance.
EAS, external anal sphincter; IAS, internal anal sphincter; MRI, magnetic resonance imaging; RAIR, recto-anal inhibitory reflex.
[a] Only findings relevent to functional disorders included in this table.
[b] Without an abnormal balloon expulsion result any findings (except anorectal areflexia) should be interpreted with caution.
[c] Absent rectoanal inhibitory reflex.

Table 1

standard tests for investigating rectal emptying. They are indicated in patients with evacuation disorders, particularly if surgical intervention is being considered.[4] Both can evaluate emptying in a real-time fashion and demonstrate functional (pelvic floor dyssynergia) as well as mechanical (rectocele (an outpouching of the rectum anteriorly during straining; Figure 2), intussusception, etc.) causes of impaired evacuation.

Magnetic resonance defaecography has the advantage of being able to image all pelvic compartments without using ionizing radiation. However, it is generally felt to over-report clinically irrelevant variations in structure or function, and is generally performed in the (non-physiological) supine position. This, together with a paucity of normative data, limits the interpretability of results.

Clinical relevance of anorectal function test results

Although there is no widely accepted consensus on physiological nomenclature for the classification of anorectal disorders, a summary of the clinical relevance of test findings is presented in Table 1; findings are classified as 'major', 'minor' and 'of questionable clinical significance'.[4]

For faecal incontinence, the major physiological findings to guide patient management are anal hypotonia/hypocontractility with or without an anal sphincter defect. Patients with a combination of poor sphincter function and a large external sphincter defect may benefit from anal sphincter repair, whereas patients without a significant defect can be better triaged to sacral neuromodulation.

For evacuatory dysfunction (which frequently underlies coexisting incontinence) where impaired evacuation is secondary to mechanical obstruction alone, benefit can be provided by surgical repair (rectopexy/rectocele repair). However, most phenotypes are characterized by more than one physiological abnormality, so decision-making is often best undertaken in a multidisciplinary setting.[3,4] ◆

KEY REFERENCES

1 Palit S, Lunniss PJ, Scott SM. The physiology of human defecation. *Dig Dis Sci* 2012; **57:** 1445–64.

2 Rao SS, Bharucha AE, Chiarioni G, et al. Functional anorectal disorders. *Gastroenterol* 2016; **150:** 1430–42. https://doi.org/10.1053/j.gastro.2016.02.009.

3 Norton C, Thomas L, Hill J, et al. Management of faecal incontinence in adults: summary of NICE guidance. *Br Med J* 2007; **334:** 1370–1.

4 Carrington EV, Scott SM, Bharucha A, et al. Expert consensus document: advances in the evaluation of anorectal function. *Nat Rev Gastroenterol Hepatol* 2018; **15:** 309–23.

5 Grossi U, Carrington EV, Bharucha AE, et al. Diagnostic accuracy study of anorectal manometry for diagnosis of dyssynergic defecation. *Gut* 2016; **65:** 447–55.

