

Diagnosing and Managing Faecal Incontinence

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Abstract

The aim of this review was to consolidate the impact of recent advances in investigation technology on the clinical diagnostic workup for faecal incontinence. A literature search was made with emphasis on the recent 15 years. The advent of imaging techniques, particularly endoanal ultrasound has improved the understanding of anal incontinence. Of particular significance was the much higher incidence of anal sphincter injuries after childbirth, than previously suspected. Also important was the clarification of the entity of primary degeneration of the internal anal sphincter. Although endoanal ultrasound provides clear images of anal sphincter defects to guide surgery, some of these defects may be false positive findings especially for the inexperienced. Thus, anal manometry is still required to correlate imaging with functional impairment. Recent data have questioned the correlation of poor surgical outcome after sphincter repair with pudendal nerve dysfunction. Although poor pudendal function is no longer considered a contraindication for surgery, longer term follow-up studies have shown that the late results are poorer probably due to other factors such as poorer tissue associated with nerve dysfunction. Furthermore, new treatment modalities such as the electrostimulated graciloplasty, artificial anal sphincter, sacral nerve modulation and autologous fat injection into the anal mucosa will require detailed precise diagnosis of faecal incontinence such that the most suitable technique may be successfully employed.

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Introduction

Faecal incontinence is the inability to control the passage of gas, liquid or solid through the anus. Its severity varies from infrequent passage of gas to persistent lack of control of solid stools. Faecal incontinence causes great distress to the patient because it causes loss of personal hygiene, social isolation and loss of self-esteem.¹⁻⁵ These latter factors cause the patients to be too embarrassed to admit to incontinence.⁶⁻⁹ Therefore, the 2.2% to 7% reported prevalence of faecal incontinence is likely to be an underestimation of this debilitating problem.^{1,10,11} Nonetheless, awareness of this condition is of the uttermost importance because incontinence can in most cases be successfully treated with the patient regaining a normal working and social life. Improvements in treatment over the recent years have been due in no small way to the advent of endoanal ultrasound, which has led to refinements in diagnosis and management strategy of anal incontinence.

Thus we decided to review the recent progress made in the diagnosis of faecal incontinence by a critical examination of relevant literature identified by a 15-year Medline search as well as other publications, especially by local authors. The anatomy and physiology of the

anal canal are first reviewed, being essential to the understanding of diagnosis and treatment. We will then discuss the causes of faecal incontinence, as well as the current clinical diagnostic modalities and their impact in determining treatment strategies.

Anatomy and Physiology of the Anal Canal

The anal sphincter consists of 2 components, the internal sphincter formed by smooth muscles and the external sphincter formed by voluntary muscles. A sustained tonic contraction of the internal sphincter provides 85% of the basal resting anal tone.¹²⁻¹⁵ The resting tone is maintained and hence continence is reassured even during sleep. Augmentation of anal pressures in times of sudden need, such as raised intra-abdominal pressures during coughing, is provided by the external sphincter. However, this is only for limited periods of time because the external sphincter fatigues after about 60 seconds.^{17,18} The internal and external sphincters act in combination to form a physiologic high pressure zone, about 4 cm in length.¹⁹ This physiologic high pressure zone is longer in men than in women.^{15,19} There is considerable controversy over the specific function of various individual components of the anal sphincter.^{20,21} The puborectalis which forms the anorectal angle by slinging

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around the posterior of the junction between the anus and rectum,²²⁻²⁴ is probably important for controlling continence over solid stools.²⁵ The anal cushions which can contribute a variable amount to the anal pressures, according to the amount of blood flowing through its arteriovenous channels, probably provide control over flatus.²⁶

In addition to the anal sphincter complex, normal rectal function is also needed to maintain proper continence.^{27,28} The rectal walls distend to accommodate the faecal load during its arrival into the rectum, and thus dampens the rising pressures. This works together with the high pressure zone of the anal sphincter to contain the faecal load and to delay evacuation until the appropriate time.^{19,29} In fact, continence depends upon the coordinated activity of the gastrointestinal tract, pelvic floor, and the anal sphincters, which are all under influence of the central nervous system. Most of the time, continence is maintained subconsciously, but voluntary control also has an important role in deferring evacuation during socially inconvenient situations.¹

Causes of Incontinence

Incontinence may occur when any part of the complex mechanism described above are affected by various pathologies. Thus the more common aetiologies include:

a) Neurological Causes

Lower motor neurone lesions of the sacral nerves lead to paralysis of the pelvic floor muscle and external sphincters.^{30,31} Degenerative change and ageing may affect the spinal roots leading to impaired rectal sensation and weakened anal sphincter to cause incontinence.^{32,33} Metabolic disorders such as diabetes mellitus may result in autonomic neuropathy, leading to colonic dysmotility and partial denervation of the anal sphincter.³⁴ Other systemic conditions such as multiple sclerosis, Parkinson's disease, systemic sclerosis, myotonic dystrophy and amyloidosis may also cause incontinence.^{7,35,36}

b) Colorectal Causes

Congenital conditions such as imperforate anus-rectal agenesis and Hirschsprung's disease may result in incontinence despite surgical corrections.³⁷ Inflammatory disorders such as ulcerative colitis, Crohn's colitis or infectious colitis cause rapid colonic transit and possibly impaired rectal compliance. A fistula-in-ano may also result in incontinence if it bypasses the anal sphincter mechanism.³⁸ Incontinence may also be the presenting feature of benign or malignant neoplasms. Villous adenoma may produce excessively large amounts of mucus, leading to soiling. A rectal tumour may cause partial obstruction and overflow incontinence. A low rectal tumour may also invade and damage the sphincter, or it may produce a rectovaginal fistula. It is thus

important that colonoscopy be performed to exclude the presence of a tumour in patients with incontinence.¹

c) Anal Sphincter and Pelvic Floor Causes

The most common cause of sphincter damage is obstetric injury.³⁹ Vaginal delivery but not Caesarean section may result in anal sphincter injury as well as pudendal neuropathy.⁴⁰ Disruption injuries may be due to the episiotomy, perineal laceration, and/or forceps extraction.^{41,42} Similar damage and disruption to the anal sphincters may result from trauma, especially penetrating injuries. The pudendal nerve's inferior rectal branch supplies the external sphincter. Studies have suggested that the nerve may be damaged by traction during prolonged 2nd stage of labour, resulting in a prolonged pudendal motor nerve terminal latency (more than 2.4 m/sec).⁴³ However, this has been shown to be reversible in 60% of patients after a period of 3 months.⁴⁴ As the nerve can have cross-over innervation, patients with unilateral damage may not have any appreciable symptoms of incontinence.²⁷

Fifty per cent of patients with rectal prolapse may have faecal incontinence.⁴⁵ Possible pathogeneses include progressive stretching of the external sphincter,⁴⁶ gross perineal descent and pudendal neuropathy,⁴⁷ and persistent inhibition of the rectoanal inhibitory reflex from dilation of the rectum by the prolapsing mass.⁴⁸ Despite minor anorectal surgery being very commonly practised for haemorrhoids, anal fissures and fistulas, possible iatrogenic injuries do not appear to be a major cause of faecal incontinence. However, more major operations like low anterior resection and total abdominal colectomies may be associated with mild faecal incontinence that is usually self-limiting.^{7,48-53}

Diagnostic Modalities

a) Anal Manometry

This is one of the commonly used anorectal physiological tests.⁵⁴ Equipment available includes microballoons,^{55,56} perfusion⁵⁷ or solid state microtransducers.⁵⁸⁻⁶¹ Perfusion catheters with the small ports at the tips, allow multiple measurements of radial pressures at each level.^{62,63} Computer enhancement will then allow a 3-dimensional graphical display of the pressures at various sectors of the anorectum.⁶²⁻⁶⁴

Anal manometry quantifies the function of the anal sphincter complex and analyses the pressure vectors in the various sectors of the anorectal region. Resting anal pressure depends on a combination of factors: nerve-induced internal sphincter activity, myogenic internal sphincter activity, external sphincter tonic activity, and expansion of the haemorrhoidal plexus.⁶⁵ The mean resting pressure is usually about 60 mmHg, and fluctuates with amplitude of 3 to 15 mmHg at a frequency of 10 to 20 per minute.²³ It is usually lower in women⁶⁶ and

elderly patients.⁶⁷ It is highest the lower third of the anal canal. The maximum squeeze pressure assesses the external anal sphincter function at maximum contraction. Its amplitude is usually about two to three times the measured mean resting pressure, when the external anal sphincter is functioning normally.⁵⁹ The high pressure zone is defined as the length of anal canal where the resting pressures are above 20 mmHg in more than 50% of its circumference.⁶⁸ The rectoanal inhibitory reflex is elicited when the rectum is distended. There is a drop in anal pressures due to reflex relaxation of the internal sphincter, followed by a recovery due to compensatory external anal sphincter activity. Spontaneous relaxation of the internal sphincter without a concomitant increase in the external sphincter may be a factor leading to incontinence.^{69,70}

Critics of anal manometry have argued that there is considerable overlap between normal and incontinent patients,^{69,71} and up to 40% incontinent patients may have normal manometric pressures.⁷² However, it has been found that there is good reproducibility of manometry when account is taken into the normal variations in anal pressures with different sex and age groups.^{27,73-75} Manometric findings also correlate significantly with faecal incontinence, when such facts are taken into account.⁷⁶ It has also been found to provide important information for clinical decisions that cannot be derived from digital rectal examination alone.^{27,77,78}

b) Proctometrography

This technique objectively quantifies the pressures and sensitivity of the rectum. A balloon is placed into the rectum and it is gradually filled up with water at a steady rate. The volume is taken when the subject perceives a sensation of cold or fullness.⁷⁹ This is usually less than 30 ml, and is higher in women,⁸⁰ the elderly,²⁹ and if rectal sensation is impaired by disease. The volume of initial sensation is impaired in about one third of patients with faecal incontinence. The maximum tolerable volume measures the volume of water distending the rectum, when distension can no longer be tolerated. It estimates the reservoir capacity of the rectum, but is decreased with age,⁸¹ diabetes⁸¹ and neurogenic incontinence.⁵⁴ It is also impaired after low anterior resection.^{82,83}

Rectal compliance measures the volume change per unit pressure change during rectal distension.⁸⁴ It assess rectal accommodation, the ability of the rectum to distend and take on the arrival of faeces with minimal pressure, and thus to delay defaecation. However, the present methods of assessing do not take into account the open connection between the rectum and sigmoid, the variability in the rectal size and the elasticity of the extrarectal tissue.⁸⁵ Severely impaired rectal compliance would lead to urgency and incontinence. Such impairment may occur with inflammatory bowel disease,^{86,87}

chronic rectal ischaemia, irritable bowel disease, ileoanal pouch surgery⁸⁸ and radiotherapy.⁸⁹ The barostat visceral stimulator is a special device that measures pressure and volume. It may provide a more accurate pressure and volume measurements with computer controlled rectal distension, but experience with this modality currently remains in the research realm.

c) Electromyography

Electromyography assesses the innervation to the external anal sphincter, the muscle activity,¹⁷ maps out sphincter defects and measures the external sphincter fibre density. Surface electrodes or concentric needle electrode have been used for monitoring sphincter muscle activity. Surface electrode recordings include activity from the adjacent area, whilst needle electrodes inserted into the selected muscle are more sensitive.⁹⁰ Nonetheless, surface electrode recordings have been found to be reasonably accurate in routine recordings of crude external sphincter activity and have the important advantage of being painless and non-invasive.⁹¹⁻⁹³ Fibre density is measured using needle electrodes which have very fine pick-up points to record the activity from single motor units. The activity behaviour (fibre density) is altered with motor unit re-innervation, which reflects indirectly upon the amount of denervation and nerve injury having taken place. EMG was also used to measure localised sphincter injuries, although this has now been somewhat superseded by endoanal ultrasound imaging.^{83,94-96}

Pudendal nerve motor terminal latency (PNMTL) measures conduction function of the pudendal nerve, which innervates the external anal sphincter. A special electrode is attached to a gloved index finger, which is introduced into the anus and the stimulating point of the electrode situated over the finger tip is pressed against the ischial spine. The nerve at the ischial spine is stimulated at the ischial spine, and the electrode at the finger base detects the resulting external sphincter contraction. PNMTL is prolonged as a result of nerve injury. Some workers have reported poorer surgical results when sphincter repair for childbirth sphincter defect was performed in the presence of significantly prolonged pudendal nerve motor terminal latency, compared to when there were normal measurements.⁹⁷⁻¹⁰³ However, more recent reports showed that only late results are affected by the status of PNMTL suggesting that other associated factors such as poor tissue condition may be more important in affecting the results.¹⁰⁴⁻¹⁰⁶

d) Ambulatory Anorectal Physiology

Ambulatory anorectal physiology allows measurements under real-life physiological circumstances. It also allows detection of certain conditions that occur intermittently and may thus be missed during routine physiological testing.

e) Endoanal Ultrasound

Endoanal ultrasound is performed with the patient in a lateral position with the knees and hips flexed. The ultrasound probe is covered with an anal cone which has parallel walls and the diameter is less than 2 cm. It is easy to perform, requires no preparation and causes minimal discomfort. Endoanal ultrasound enables the thickness, echogenicity, homogeneity and textural pattern of the sphincter muscles to be seen.¹⁰⁷ However, the correlation between the muscle thickness and manometric findings have only been recently understood. Internal sphincter thickness does not correlate well with manometric pressures measured, and it is believed that the sphincter thickens due to collagen deposit with age.¹⁰⁸⁻¹¹⁰ No correlation has been shown between the manometric maximum squeeze pressures and the external sphincter thickness.¹⁰⁸⁻¹¹⁰ Endoanal ultrasound enables the visualisation of the entire ring of the sphincter muscle. Examination of patients with previous internal sphincterotomy shows sonographic defects corresponding to site of surgery.¹¹¹ Anal dilatation may result in multiple defects or fragmentation of the sphincter.¹¹² External sphincter defects are more difficult to recognise as damage results in scars that tend to be homogenous. However, such endosonographic lesions have been correlated with electromyographic studies¹¹³⁻¹¹⁵ and with surgically confirmed tears.¹¹⁶

The advent of endoanal ultrasound has radically changed the previous concept that pudendal nerve damage was the underlying cause of faecal incontinence in most patients.^{117,118} It was found that localized sphincter injuries were more common and the cause of the dysfunction in most cases. It has also allowed the identification of degenerative disorders of the sphincter muscle.¹¹⁹ It is likely to replace the use of routine electromyographic studies for the mapping of structural defects. Is endoanal ultrasound the only test that is needed for diagnosis of faecal incontinence? Endoanal ultrasound reveals structural details of the anal sphincter only, and though this may correlate with function, it is by no means foolproof. There have been reports of false positive findings, in which patients have asymptomatic sphincter defects.^{120,121}

f) Magnetic Resonance Imaging

Magnetic resonance imaging of the anal canal can be done using a special coil that is placed within the anal canal. It is much more costly than endoanal ultrasound. However, it provides improved images of the external sphincter and fistula tracts and may be useful in patients with equivocal ultrasound findings.^{122,123}

Treatment

a) Biofeedback

Biofeedback aims to retrain and re-coordinated anorectal pelvic floor activity. This is achieved by feeding back

biological information to the patient. Biological activity is monitored by either electromyography or manometry, and the information is viewed by the patients on a screen, so that they can consciously direct improvements. Biofeedback is relatively non-invasive and has no side-effects. Four successive weekly sessions are normally required. However, it is time-consuming and also depends on a good therapist.^{27,124} It is usually successful in managing minor faecal incontinence¹²⁵ and may be preferred in neurogenic incontinence because the results of surgery for this type of incontinence have been inconsistent.¹²⁶

b) Medication

Medical management alone is helpful in restoring continence in 16% to 40% of patients with relatively minor symptoms.¹²⁷⁻¹²⁹ The aim of medical treatment is usually to correct the underlying intestinal cause of faecal incontinence. Studies comparing the efficacy of biofeedback with medication have shown varying results.^{130,131}

c) Surgery

There are various options available for surgical treatment, varying from a simple repair to the construction of a neo-sphincter. The commonest reparable defect is damage to the sphincter from obstetric trauma. In the presence of a single defect, the operation of choice is an overlapping sphincter repair.^{117,132,133} Non-overlapping repair is commonly used by obstetricians in the acute setting, and has been used with some success by a few surgeons in the non-acute situation.¹³⁴ Postanal repair has been performed for primary neurogenic incontinence. This gives short-term benefits in up to 83% of patients, but long-term effects last only in up to 28% of patients.¹³⁵⁻¹³⁷ Other options include sacral nerve stimulation, though the exact mechanism of action is still not known.

For patients with disrupted irreparable sphincters or patients that have failed sphincter repairs, there are a number of new treatment options. With isolated passive leaks from internal sphincter insufficiency, there is one report of collagen injection, but the long-term results are not yet established.¹³⁸ With severe passive leakage, a form of skeletal muscle transposition may be used. The earliest report was in 1952 by Pickrell et al¹³⁹ where the gracilis muscle was used. This involved the detachment of the gracilis muscle at the distal insertion, and then wrapping it around the anal sphincter. Current improvement over the original operation entails chronically stimulating the skeletal muscles with the use of an electrical implant. Good results have been reported in up to 78% of patients who had dynamic graciloplasty for incontinence.¹⁴⁰⁻¹⁴² The artificial bowel sphincter is a modified version of the artificial urinary sphincter. It includes a cuff which surrounds and occludes the anal

canal, connected to a pressure-regulating balloon implanted in the abdominal wall. A control pump is placed in the labia or scrotum, which controls the transfer of fluid to and from the cuff. The cuff pressure can thus be regulated during normal activity, and released during defaecation. There are currently 3 published reports with a success rate of 73%.¹⁴³⁻¹⁴⁵

Conclusion

Faecal incontinence is a socially debilitating condition for the patient. Successful treatment of faecal incontinence depends on an accurate diagnosis of the underlying problem. This includes a detailed history and physical examination, anorectal physiology and ultrasound studies. Subsequent management by medication, biofeedback or surgery then depends upon the underlying cause. With the recent and coming advances in diagnosis and treatment, no patient should either remain incontinent or contend with a permanent stoma.

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