REVIEW

Investigation and treatment of faecal incontinence

S Maslekar, A Gardiner, C Maklin, G S Duthie

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Faecal incontinence is a debilitating condition affecting people of all ages, and significantly impairs quality of life. Proper clinical assessment followed by conservative medical therapy leads to improvement in more than 50% of cases, including patients with severe symptoms. Patients with advanced incontinence or those resistant to initial treatment should be evaluated by anorectal physiology testing to establish the severity and type of incontinence. Several treatment options with promising results exist. Patients with gross sphincter defects should undergo surgical repair. Those who fail to respond to sphincteroplasty and those with no anatomical defects have the option of either sacral nerve stimulation or other advanced procedures. Stoma formation should be reserved for patients who do not respond to any of the above procedures.

the outset to differentiate true incontinence from perineal soiling because of inadequate hygiene or prolapsing haemorrhoids.

History

It is essential to determine the severity of symptoms and to ascertain the form in which their symptoms present. Direct questioning should be performed in a sensitive manner allowing for elucidation of whether the patient suffers from soiling and/or leakage of faecal material or faecal urgency.

The onset, frequency, and consistency of stool should be carefully evaluated. In some cases patients may present with FI as a result of loose stool, which should be investigated further to exclude pathology. The typical function of anal canal is to control solid or semi-solid stool and thus a proportion of the normal population may be unable to completely control loose stool. Conversely, loss of solid stool generally suggests a greater degree of physiological impairment. In this situation, the application of pharmacological agents possessing constipating effects may be started. The degree of incontinence can be derived from the number of pads or other protection methods used and from restrictive changes in lifestyle. All patients should complete a full bowel symptomatology questionnaire, along with quality of life questionnaire (SF 36)^{7,8} and FI assessments to obtain a clear active representation of their symptoms and overall quality of life. In addition, the authors routinely request patients to complete a bowel symptom diary (available on line <http://www.postgrad-medj.com/supplemental>) for a minimum period of two weeks. Evidence regarding previous anorectal surgery and obstetric history should be ascertained.

The symptom of FI is unique in that no physiological index of severity correlates with clinical severity, and hence scoring systems are routinely used.⁹ The most commonly used system includes variables such as frequency, type of incontinence, extent of lifestyle changes, and the need to wear a pad.¹⁰ Vaizey *et al* showed that all the existing scales for the assessment of FI correlate well with the physicians clinical impression¹¹ and hence are reproducible measures for comparison of outcomes. Another issue is that of data collection: diary compared with patient recall. The authors routinely use the diary method as it is far more stringent than patient

The continence of faeces is regulated through complex integrated and coordinated activity between the anal sphincters and the rectum. Reflex and voluntary activity of the internal and external sphincters, the puborectalis sling, rectal capacitance and sensitivity all make important contributions to continence. Erratic function of any of these mechanisms can result in faecal incontinence (FI), which affects about 1.4% of the population over 40 years of age in the United Kingdom.¹

FI is a condition with well reported adverse physical, social, psychological, and economic consequences.² Yet only a third of patients discuss their symptoms with their physicians and silently suffer embarrassment, shame, and sometimes depression.³ Ordinary social activities are either curtailed or completely avoided. Box 1 shows the aetiology of FI.

Conservative treatment is the first step in the management of FI and is effective in more than 50% of patients. The initial management includes dietary advice, antidiarrhoeal or constipating drugs, biofeedback therapy,^{4,5} and more recently rectal irrigation.⁶ The authors have devised an algorithm to be used in the management of patients with symptoms of FI, which will be discussed further.

INVESTIGATION

Patients presenting with FI find the subject difficult to discuss, and sometimes provide inaccurate or misleading information. This makes proper history taking and examination a vital step in their management. It is important at

See end of article for authors' affiliations

Correspondence to:
Mr G S Duthie, University
of Hull, Academic Surgical
Unit, Castle Hill Hospital,
Castle Road, Cottingham,
East Yorkshire HU16 5JQ,
UK; g.s.duthie@hull.ac.uk

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Abbreviations: FI, faecal incontinence; EAUS, endoanal ultrasonography; IAS, internal anal sphincter; EAS, external anal sphincter; IP, impedance planimetry; PNTML, pudendal nerve terminal motor latency; ACE, antegrade continence enema; ABS, artificial bowel sphincter; SNS, sacral nerve stimulation

Box 1 Causes of faecal incontinence*

- Anatomical
 - Vaginal delivery, obstetric injury
 - Anorectal surgery including lateral sphincterotomy, anal stretch, haemorrhoidectomy, surgery for fistula-in-ano
 - Pelvic fracture
 - Sphincter saving operations like low anterior resection, coloanal reservoir
- Congenital
 - Anorectal malformations
 - Cloacal defects
 - Meningocele, myelomeningocele
 - Imperforate anus
 - Rectal agenesis
- Neurological
 - Diabetes mellitus
 - Multiple sclerosis
 - Spinal cord lesions—tumours, injuries, infections
 - Pudendal neuropathy due to stretch nerve injury (vaginal delivery, descending perineum syndrome, chronic straining at stool)
 - Central nervous system disorders—stroke, trauma, infection, tumours
- Functional
 - Inflammatory bowel disease
 - Faecal impaction
 - Diarrhoea
 - Malabsorption
 - Physical disabilities
 - Rectal prolapse
 - Laxative abuse
 - Radiation proctitis
 - Short gut syndrome
 - Hypersecretory rectal tumours
 - Anal fistula
 - Encopresis

*Modified from Madoff *et al.*³

recall. Quality of life should also be assessed and this must be separated from the severity indices. Both general quality of life and disease specific indices such as FI quality of life should be used.¹² This recently validated FI specific quality of life instrument is more sensitive than generic scales.¹²

Physical examination

A reasonably simple outpatient clinical examination can disclose the cause and severity of FI in many cases; although it must be emphasised that endoanal ultrasound is the gold standard investigation. Moreover, clinical examination has importance in elderly patients where often the cause of FI is simply faecal impaction. A thinned perineal body or scars from a previous operation can be suggestive of the cause. Gaping of the anus may be indicative of rectal prolapse,

Figure 1 Endoanal ultrasound image showing a defect in the external anal sphincter.

which can be demonstrated with a Valsalva manoeuvre. Digital rectal examination can show both the resting tone and its increase with squeeze, faecal impaction, and tumours. Flexible sigmoidoscopy should be done in all cases; a complete colonoscopy reserved for patients with unexplained diarrhoea, bleeding, or changed bowel habits.

Physiological investigation

In the absence of demonstrable colonic abnormality, assessments of physiological function should be performed to determine the aetiology and severity of the symptoms. The key investigations include endoanal ultrasonography, anal-manometry, electromyography, and defecography.

Endoanal ultrasonography (EAUS)

Endoanal ultrasonography is a simple and rapid test that enables visualisation of the anal canal musculature and the presence or absence of sphincteric defects.¹³ Figures 1 and 2 identify external anal sphincter (EAS) and internal anal sphincter (IAS) defects respectively. This method has a sensitivity and specificity of nearly 100% in identifying the defects of the external and internal anal sphincters.^{13 14} Magnetic resonance imaging, especially with an endoanal coil has a similar accuracy; but EAUS is more accurate in identifying the internal sphincter defects. This imaging technique has particular importance in assessment of parous women, where sphincter defects are common, and also to rule out colonic abnormality in patients with sphincter defects.

Anorectal manometry

Anorectal manometry is widely used for assessment of internal anal sphincter function (resting anal pressure), external sphincter pressure (maximum anal squeeze pressure), anal sphincter length and the high pressure zone of the anal canal, and for simple assessment of rectoanal integration (the rectoanal inhibitory reflex).¹⁵ Simultaneous measurement of anal canal and rectal pressure allows for real time measurement during various simulated situations. Initially, the resting pressure is assessed, which provides a measurement of anal tone, corresponding to the IAS and its ability to preserve closure of the anal canal. The reflex activity of the EAS is monitored during coughing while observing the resultant trace. In normal subjects, there should be a sharp increase in the anal canal pressure that supersedes an increase in pressure within the rectum. Balloons placed in the anal canal and connected to transducers or perfusion catheters record static and “squeeze” pressures, and duration

Figure 2 Endoanal ultrasound image showing a defect in the internal anal sphincter.

of voluntary squeeze, hence assessing the anatomical and physiological integrity of anal sphincters. The important problem with manometry is that the normal pressures vary in different people, between men and women and in different age groups. There are longitudinal as well as radial variations. The range of normal sphincter length based on pull through techniques is 2.5–5 cm. Anal canal length and maximal squeeze pressures tend to be greater in men compared with women; however, resting anal pressure is comparable between men and nulliparous women, which tends to decrease in the parous women.¹⁵ Moreover, there is usually no demonstrable improvement in manometric abnormalities with successful treatment of FI in most cases.³

The ability to postpone defecation is an intrinsic feature of continence and this is defined by the contractility of the EAS. Anorectal manometry is used to determine this contractility, wherein the patient simulates postponement of defecation through anal contraction. In normal subjects there should be a significant increase in the anal canal pressure.

The ability to sustain contraction of the EAS may play an important part in the maintenance of anal continence. A small study by Read and Read in 1982 found that the mean duration of voluntary contraction of the EAS was 3.2 minutes. The fatigue rate index (FRI) developed by Marcello *et al*¹⁸ is an assessment of strength and endurance, and gives an indication of how long it takes the EAS to fatigue from maximal contraction to baseline resting pressure. Telford *et al*¹⁹ showed that the FRI can be used to discriminate between incontinent and control patients and it correlates with the symptom severity score. However, despite these early results, there are no properly powered studies and the index is not routinely used in all anorectal physiology laboratories.

The next step is to determine rectal capacity as patients with reduced capacitance of the rectum will often show symptoms of increased frequency and faecal urgency. It is recognised that the use of localised radiotherapy can cause reduced rectal capacity, as indeed can resection of the rectum.¹⁶ Rectal capacitance can be determined through gradual and sustained filling of a balloon with water while positioned within the rectum, and comparing it with the rate of change of rectal pressure. The patient is requested to acknowledge sensations of flatus, urge to defecation, and the maximum tolerated volume.¹⁵ With a known infusion rate and duration of inflation, rectal volumes may be determined and compared against normal values. Patients with space occupying lesions of the rectum, for example, rectal cancer,

rectal prolapse, and those with inflammatory bowel disease, could be expected to have poor capacitance.

It is however not possible to find out whether or not a reduced capacity is a true reflection of FI through the use of this investigation alone.¹⁵ To obtain a clearer indication of true rectal capacity the performance of impedance planimetry (IP) is recommended. IP is used to assess cross sectional area of a lumen and can be used in conjunction with rectal filling.¹⁷

Sensory tests

Sensory function plays an integral part in continence.¹⁵ Awareness of distension of the rectum may be assessed by inflating an intrarectal balloon. Rectal distension should elicit relaxation of the anal canal, the rectoanal inhibitory reflex (RAIR). Careful questioning of the patient to confirm absence or presence of sensation will provide an indication of sensory function. However, the data should be interpreted with caution. Abnormal rectal sensation as measured by above technique can simply reflect impaired viscoelastic properties rather than disturbed sensation. The results also vary between different laboratories because of differences in techniques.

The rectoanal inhibitory reflex is tested using any of the aforementioned manometric techniques; most easily by inflating a balloon attached to a Nelaton catheter via a three way valve to a syringe.¹⁵ In normal people, the reflex is seen after instillation of 10–30 ml air and is followed by a desire to pass flatus after 40–50 ml of air. The reflex is absent in Hirschsprung's disease and can be used diagnostically for this purpose. Patients with prolapse and those who underwent low anterior resection, coloanal anastomosis, or ileoanal pouch surgery may not possess the reflex. In the latter case, it usually is associated with poor functional outcomes.¹⁶

Neurophysiological tests

The above investigations can be complemented by neurophysiological measurements in terms of either single fibre electromyography or pudendal nerve terminal motor latency (PNTML).²⁰ The latter has largely supplanted single fibre electromyography despite the fact that it provides more direct evidence of muscle denervation. PNTML is performed using a finger electrode that applies a small current to the pudendal nerve at the ischial spine. The resultant contraction of the EAS around the base of the finger results from the stimulus and the time between the stimulus and the contraction is the latency. There are questions surrounding the validity of the procedure; because PNTML measures conduction time in the fastest remaining nerve fibres, significant nerve damage is sometimes overlooked. Pudendal neuropathy is reported in up to 70% of patients with FI and in more than 50% of patients with sphincter injury.²¹ It is variably reported that for those patients with prolonged pudendal latency the possibility of successful outcome after direct overlapping sphincter repair is reduced.²² However, most studies have not shown an association between treatment and PNTML.^{23–24} Several studies have shown that there is no clinical significance of prolonged pudendal nerve motor latency in idiopathic FI. Moreover, the severity of nerve injury correlated in some studies with anal motor and sensory function in patients with neurogenic or idiopathic incontinence. The routine use of PNTML in the assessment of patients with FI is therefore questionable. The lack of consensus about its accuracy and predictive value for outcomes after surgery has rightly tempered the use of PNTML.^{20–24}

Radiological investigations

Defecography is a radiological investigation normally done to determine dynamic changes in the pelvic floor and anorectum during defecation, especially in patients with occult

Figure 3 Algorithm for management of faecal incontinence.

rectal prolapse or other suspected pelvic floor abnormalities and internal rectal intussusception. However, it has a limited role in most incontinent patients because the methods for conduct of the test and interpretation are not standardised.²⁰

TREATMENT OPTIONS

Medical therapy

All patients suffering from FI should be offered initial conservative management through the use of lifestyle

changes or pharmacological agents. The algorithm developed by the author is shown in figure 3 and shows the pathway to be adopted in the management of FI. Simple manipulation of diet including avoidance of foods that cause diarrhoea or urgency can often improve patient's symptoms especially when they are mild. When combined with supplementary fibre and bowel habit training, it might result in cure in a small select group of patients with mild FI, although there is no study or evidence demonstrating this phenomenon. It is

known that patients with FI do not have a different nutritional profile from people without FI and no study has found a link between fluid intake and FI.²⁵

The initial evaluation should be able to identify specific causes of FI such as irritable bowel disease, laxative abuse, coeliac disease, diabetes, rectal prolapse, and others, because treatment of these conditions often resolves the symptoms.

In patients with diarrhoea, assessment and specific treatment of the underlying cause are necessary. Bulk forming and hydroscopic agents can alleviate mild chronic diarrhoea by absorbing water and increasing stool bulk and possibly by creating the perception of decreasing stool fluidity. Loperamide is a synthetic opioid that decreases intestinal motility and secretion, increases sphincter pressure, and reduces urgency, stool volume, and frequency of bowel movements. The antidiarrhoeal action is derived from its functioning as both a calcium receptor antagonist and a calcium channel blocker.²⁶ Specific benefits for loperamide in the treatment of FI were seen in an early study by Read *et al.*,²⁷ who found that loperamide reduced urgency and incontinence, increased anal canal resting pressure, and improved the ability to retain saline infused into the rectum. In this study, all patients who complained of diarrhoea and FI were treated with loperamide for one week and compared with similar patients receiving placebo.

Tricyclic agents such as amitriptyline and imipramine have been empirically used to improve symptoms for patients with idiopathic FI that is resistant to initial medical management or to biofeedback. In an open label study, 18 patients with idiopathic FI who received low dose amitriptyline for four weeks and 24 healthy subjects who did not receive the agent were evaluated.²⁸ Treatment decreased amplitude and frequency of rectal motor complexes and prolonged colonic transit time, leading to the formation of firmer stools that were passed less frequently. Sixteen of 18 amitriptyline treated patients had statistically significant improvements in incontinence scores. The ideal indication for these drugs therefore is the patient with FI who has reduced resting pressure and poor rectal capacity.

Direct pharmacological agents such as phenylephrine gel can increase the resting anal canal pressure. However, a randomised clinical trial of 12 patients showed that phenylephrine significantly improved FI scores and increased resting anal canal pressure.²⁹ However, all patients had ileal reservoir pouch and hence it is debatable whether these findings could be extended to those with idiopathic FI. A further study showed that phenylephrine gel increased mean resting pressure, but all patients had passive faecal leakage and intact functioning sphincters rather than FI.

More recently, rectal irrigation has been identified as a form of management for patients suffering from FI.^{6, 30} The technique entails infusing tepid water directly into the rectum, which facilitates removal of faecal matter. The rectum is then emptied and the technique repeated as required. When used on a routine basis, it provides a form of self management allowing for increased patient autonomy enabling them to be in control of their symptoms. Many patients have found satisfaction with this technique³⁰ and it has alleviated the need for surgical intervention in some cases.⁶ Short term studies have shown excellent results, with most patients finding the treatment acceptable and more than 50% patients showing improvement in incontinence.⁶ The authors themselves have found good long term results with the use of rectal irrigation for idiopathic FI and also patients with rectal evacuation disorders.

Biofeedback is usually the first line of treatment if medical therapy fails, especially in patients with mild to moderate FI and in some patients with severe FI. It has received great attention, probably because of the ease of use and lack of

adverse effects. The goal here is to improve contraction of the external anal sphincter in response to rectal distension. Various protocols and feedback equipment have been reported, including coordination training, sensory training, and strength training.³¹ Success after biofeedback ranges from 38% to 100% in various studies^{32–34} and is not influenced by the type of technique. The exact mechanism of action of biofeedback is poorly understood. No consistent changes in sphincter pressures, rectal distension, or duration of contraction are reported. Although a systematic review⁴ found that biofeedback eliminated symptoms in up to one half of patients and decreased symptoms in up to two thirds, most studies suffered from methodological problems, lack of controls, and a lack of validated outcome measures. A recent study by Norton *et al.*³⁵ concluded that patient-therapist interaction and patient coping strategies may be more important in improving continence than performing exercises or receiving physiological feedback. Much of the research associated with biofeedback also recognises the need for patient compliance and this is critical to success.^{31, 32}

Various other treatment modalities exist, especially in communities and in elderly nursing homes. External pads are often used by patients but are very difficult to use because of the odour and the associated skin problems. Anal plugs are devices that can be inserted into the anal canal. Different types of anal plugs are available, all aiming to block the loss of stool. Initially introduced for patients with FI attributable to neurological problems, the indication has now gradually extended to those without underlying neurological deficits. However, a recent review³⁶ of anal plugs for FI concluded that anal plugs can be difficult to tolerate. For those who do persist, plugs may be helpful in alleviating problems of incontinence, either as a substitute to other forms of treatment or as an adjuvant treatment option. However, the data were found to be limited and incomplete and the conclusions were only tentative.

SURGICAL OPTIONS

Surgical intervention for the treatment of FI is generally centred on repair of anal sphincters with resultant restoration of the anal aperture. If severe defects in the sphincter are recognised at the time of childbirth, immediate direct repair is advocated. However, if this is not done, it is advisable to wait for at least six months to assess the full functional extent of the injury and to allow the tissue oedema to settle down.

Sphincteroplasty

Overlapping sphincter repair is the primary management of patients presenting with external sphincter defects, and this can produce reasonable results.³⁷ Anterior overlapping repair is more frequently performed in keeping with the more common aetiology of an obstetric injury. The authors favour repair in the prone jack-knife position with prophylactic antibiotics and pre-operative bowel preparation. The technique consists of placement of a curvilinear incision over the perineal body and the scarred sphincter is dissected up to the healthy muscle on both sides. The scar is transected and an overlap repair is performed to ensure an intact ring of muscle. Some surgeons add levatoroplasty to the technique to achieve an increased length to the anal canal, but there is no objective evidence for the same. The author performs individual repair of the IAS and EAS and has been able to achieve excellent results in selected patients. Furthermore, randomised trials have shown no benefits of diverting stomas and it only increases morbidity.³⁸ Posterior and lateral overlapping sphincteroplasty are less commonly performed, although mostly for defects arising as a result of haemorrhoidectomy or lateral anal sphincterotomy.

All published reports of results of overlapping technique have shown significant improvements in symptoms of FI, with 60%–80% achieving continence.^{39–41} It is also clear, however, that control deteriorates over time with only 50% of initial successful outcomes having improved continence at five years.^{24 42 43} Malouf *et al*²⁴ reported the first long term results, with none of the patients being fully continent to both stool and flatus and only four were totally continent to solid and liquid stool at five years; successful outcome was noted in 23 of 46 patients.

The exact aetiology of this deterioration is unclear; role of pudendal nerve function is the most controversial. Most series show no evidence of association whatsoever.^{24 41} although conflicting results do exist. Various other hypotheses like breakdown of repair, ageing, or scarring have not been conclusively proved to be implicated.

The other surgical options for salvage in such patients include dynamic graciloplasty, sacral nerve stimulation, artificial bowel sphincter implants, and the antegrade continent enema. Although optimum therapy is still unclear, for patients who do not do well after sphincter repair, biofeedback has been reported to be effective.⁴⁴

Antegrade continence enema

The antegrade continence enema (ACE) procedure was first introduced in 1990 by Malone as a technique to control faecal leakage in children.⁴⁵ It was a combination of two established principles, namely the Mitrofanoff non-refluxing channel fashioned from the appendix to enable intermittent catheterisation of the bladder⁴⁶ and the principle of the antegrade colonic enema to purge the colon of its contents in a controlled manner, aimed at preventing faecal leakage. The appendix is used as access into the caecum creating a catheterisable channel through which antegrade enemas could be given. Technical modifications have meant that it is no longer necessary to reverse the appendix and introduction of laparoscopic technique has simplified it further. This technique has had consistent success in paediatric practice and its indication has been extended to include adults with FI.⁴⁷ It is clear that patients resistant to biofeedback or conventional surgery have an underlying rectal evacuatory disorder as a result of both sensory and motor disturbances within the anorectal complex. The use of ACE aims to improve symptoms of disturbed evacuation, and can also improve faecal continence by ensuring regular colonic emptying. To date experience with ACE in adults is limited.^{48–50} The short term results have been good proving beneficial in 40%–60% of cases. Long term outcomes⁴⁹ have been acceptable, but plagued by patient compliance. The main challenge in these patients is not in the technical aspects of the surgery but in patient selection, education, and motivation. Leakage of material from the stoma is the commonest side effect. Stenosis of the stoma attributable to re-epithelialisation can be prevented by daily or even twice daily introduction of the catheter with or without irrigation. Despite these problems ACE can offer some patients considerable symptomatic and quality of life improvement.^{49 50} Good stoma care nurse specialist support providing practical help and advice is mandatory. The author has found that if patients are educated to tailor their own regimens, the results are much more satisfactory.

Gracilis neosphincter

Transposition of the gracilis muscle from the inner side of the leg to function as a neosphincter was first reported by Pickrell *et al*⁵¹ in the late 1950s. The muscle is wrapped around the EAS and while initially successful, function tended to deteriorate quickly because of muscle wastage. Moreover, the physiological inability of the muscle to maintain

prolonged tonic contraction led to poor long term success rate and hence the operation was rarely used.

Electronic stimulation of the muscle was developed in the 1980s in an attempt to overcome the aforementioned shortcomings.⁵² Dynamic graciloplasty consists of implantation of an electronic stimulator into the abdomen to stimulate the muscle via intramuscular leads, converting fast twitch muscle fibres to slow twitch fibres and also providing continuous muscle stimulation, without the patient voluntarily doing the same.⁵³ Muscular conversion occurs during the “training” phase, usually lasting around eight weeks. The conversion enables the transposed muscle to act as a neoanal sphincter in the long term for patients with intractable incontinence. The patient deactivates the pulse generator whenever they wish to effect defecation.

This “dynamic stimulated gracilis neosphincter” operation has been adopted by specialists round the world with success rates of around 70% in restoring meaningful continence.^{54–56} Multicentre studies have shown similar success rates with >50% of bowel movements in patients being continent.⁵⁵

However, dynamic graciloplasty is plagued with significant morbidity.^{54 56} The death rate for the procedure is around 2% and significant morbidity includes infections (28%), device problems (15%), and leg pain (13%). In a multicentre study,⁵⁵ 91 patients (74%) had a total of 189 complications. Infection was found to be the most serious complication and usually the cause of failure. Several studies have shown that the rate of infection is higher with surgeons with least experience.^{57 58} Although it continues to be performed, dynamic graciloplasty remains an option for refractory incontinence and should be done only in specialist centres. It has however been somewhat replaced by sacral nerve neuromodulation.

Artificial bowel sphincter

The artificial bowel sphincter (ABS) represents an alternative approach to dynamic anal sphincter replacement. Like the dynamic graciloplasty, ABS is also placed around the native sphincter via perineal tunnels. The device consists of three components: an inflatable cuff (which is the sphincter and occludes the anal canal), a pressure regulating balloon filled with radio-opaque solution located in the retroperitoneal space, and a control pump placed in the scrotum or labia. When the cuff is inflated with fluid, continence is achieved. The control pump regulates the movement of fluid from the balloon to the cuff and is manually operated by the patient permitting the passage of faeces. Generally two systems are available: Acticon Neosphincter and the AMS 800.

Initial reports using the AMS system showed good results, with about 75% of patients retaining their devices after mean durations of 20⁵⁹ and 58⁶⁰ months. The functional results were good in most series with either of the two systems; pronounced improvement in mean continence scores and quality of life.^{60–64} Recent reports on a large series of patients⁶⁵ continue to show substantial functional improvements in terms of continence, with two thirds achieving normal continence. Significant increase in the resting pressure is a logical finding, and it correlates with the clinical improvement. Most studies showed improvement in squeeze pressure, but no change in anal or rectal sensation.^{64 65}

However, in nearly all the published series, significant complications have been reported. These include infection, rupture of the cuff and loss of function of the device, skin erosion with exteriorisation of different components of the system and perineal pain.^{64–66} The repeat operation rate is high (almost up to 60% in some series⁶⁵) and a significant number of patients had definitive explantation of the device. The largest series published thus far by Wong *et al*⁶⁶ reported that of 112 patients, 51 required 73 operative revisions and 41

had device explantation. Seventy five patients had a functional device at the end of follow up.

Currently there is insufficient evidence on the safety and effectiveness of the ABS implantation for FI. A recent systematic review⁶⁷ concluded that the procedure is of uncertain benefit and should be considered experimental.

Sacral nerve stimulation (SNS) (neuromodulation)

There is a significant therapeutic dilemma when patients without a definable sphincter defect have intractable symptoms of FI. While surgical intervention has been attempted in such instances, symptomatic improvement has been found to be at best in 50% of patients.⁶⁸ The resultant outcomes of such procedures are disappointing because of the procedures attempt to correct dynamic abnormalities through mechanical manipulation. Direct electrical stimulation of the peripheral nerve supply proved transformational in the symptomatic improvement of the striated pelvic floor, urinary and anal sphincter muscles. This led to the application of sacral nerve stimulation in FI.^{69–70}

It is a minimally invasive, effective technique for idiopathic and acquired FI. The technique uses chronic low level electrical stimulation of the sacral nerves, or neuromodulation, to produce a clinically beneficial effect on the distal colon and rectum, the pelvic floor, and the anal sphincter muscles. The aetiology of incontinence in patients investigated using the technique include obstetric injury, idiopathic, scleroderma, incontinence persisting after rectal prolapse repair, spinal trauma, and after anal surgery. All patients, regardless of aetiology require thorough assessment before SNS. In the UK, the NHS National Institute for Health and Clinical Excellence (NICE) guidelines recommend the technique is performed under the auspices of a research trial, and only in centres with facilities for full anorectal investigation. Patients with previous failed medical and conservative management who present with an intact sphincter are eligible for the procedure; previous failed sphincter repair is not a contraindication.

SNS is a two stage procedure: a diagnostic stage—temporary percutaneous nerve evaluation (PNE)—and permanent sacral nerve stimulation.⁷⁰ Suitability for permanent implantation is dependent on patient satisfaction and overall reduction in incontinence episodes as determined from the bowel diaries and questionnaires after the PNE. A demonstrable reduction of a minimum of 50% incontinent episodes and/or days affected by incontinence is required for consideration of permanent implantation.

Reviews of SNS for the treatment of FI⁷¹ summarise excellent clinical results to this point. Many series^{72–76} report a reduction in FI episodes to a median of 6% or less, with some series reporting rates less than 2%. Presently there are no long term results; however the benefits seem to be maintained in the medium term,⁷² with the longest follow up being seven years.⁷⁷ It would also seem that an improvement in incontinence is mirrored with an improved quality of life. Although no randomised controlled trials exist, the durable success rates of up to 80% make it superior to any other treatment for this debilitating and demoralising condition. It may well become the treatment of choice in patients with FI that has failed conservative management.

Newer methods

Currently, novel minimally invasive approaches to FI are being investigated. The routine use of bulking agents for treatment of urinary incontinence caused by intrinsic sphincter deficiency has led to the use of similar agents for bulking the anal canal to augment its resting tone. The first report of the use of a bulking agent to treat FI was in 1993 by Shafik.⁷⁸ The injection of Teflon into the anal canal led to improvement of symptoms in all the 11 patients. Autologous

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fat⁷⁹ was subsequently used for the same purpose, with good short term results. In 2001, injectable self detaching cross linked silicone micro-balloons⁸⁰ with a biocompatible filler was used in six patients and there was a demonstrable improvement in symptoms. Polytef, glutaraldehyde cross linked collagen, PTQ implants, Durasphere, Coaptite, Permacol, Stem cells, and other products are now undergoing investigations to determine their efficacy and safety.⁸¹ Although successful use of these agents has been reported in small series with low morbidities, there has been no demonstration of a significant increase in resting or squeeze pressures with the use of any of these agents.^{81–82} Both the magnitude and durability of improvement has varied with such techniques.⁸² Also, there is no general agreement about the ideal method of injection around the anal canal. A recent review⁸¹ has shown that there is little evidence to support the practice of using these bulking agents for FI. However, except for autologous fat, the other agents have been comparatively safe and do not compromise further treatment should it be needed.

Radiofrequency (RF) energy delivery to the anal canal, known as the SECCA procedure, is another investigational approach that delivers thermal lesions to the sphincter at multiple sites and levels in the anal canal with resultant scarring. Takahashi *et al*⁸³ reported the first results of a pilot trial in Mexico showing a significant improvement in FI scores. These patients continued to have a significantly improved outcome at a further 24 month follow up. A multicentre open label prospective trial⁸⁴ evaluating the safety and efficacy of the SECCA procedure has recently been completed in the USA. Although RF energy delivered for FI safely improved symptoms and the quality of life, the results were less impressive than the pilot series.

FI in older patients

FI occurs in up to 10% of elderly people (>65 years of age) in the community and in nearly 50% of nursing home residents and has a devastating effect on them.⁸⁵ Severe constipation leading to faecal impaction, laxative abuse, diarrhoea, cognitive impairment, senescence, and neuromuscular disorders like autonomic neuropathy are among the leading causes of FI in older patients.⁸⁶ Comprehensive history and clinical examination discloses the cause in most elderly patients with FI. Diagnostic anorectal physiology and other

tests are used in the remainder of patients. The management of elderly patients with FI needs an individualised, minimally invasive, convenient, and practically feasible approach. Good nursing care including proper sanitation to prevent ulcers, motivation, and assistance in keeping physically mobile and treatment of underlying disorders are vital. Bowel emptying regimens are often helpful along with changes in diet and fluid consumption. Symptomatic medical therapy is often helpful especially in patients with diarrhoea. Rectal irrigation and biofeedback have shown good results in previous studies. For patients with isolated internal anal sphincter defects, use of anal plugs can be effective, especially in elderly patients where incontinence persists despite active treatment.⁸⁵ Acute sphincter injury can be treated with sphincteroplasty. Peripheral neurogenic incontinence may be treated with antidiarrhoeal agents, biofeedback techniques, and dietary manipulations. Significant improvements in quality of life can be achieved in these elderly patients with the use of these different modalities of treatment.⁸⁵

CONCLUSION

FI is caused by a variety of conditions and severely affects quality of life. It is embarrassing and hence only a small proportion of patients seek help. Conservative treatment is successful for most patients with mild incontinence and includes medical therapy and biofeedback or rectal irrigation. Patients with severe symptoms should be properly evaluated with anorectal physiology and endoscopy. This enables the quantification of symptoms and establishes the causes of incontinence. Recent advances have provided different options for management of these patients with varying success rates. Retrograde rectal irrigation and biofeedback have shown good results in a number of patients with severe incontinence. The most commonly used approach for patients with severe sphincter defects consists of overlapping sphincteroplasty. The novel methods including SNS and ACE procedure have offered good outcomes. However, they require long term assessment and properly powered randomised controlled trials to establish efficacy.

MULTIPLE CHOICE QUESTIONS (TRUE (T)/FALSE (F); ANSWERS AT END OF REFERENCES)

- Which of the following statements regarding faecal incontinence is correct?
 - Constipating medication has a role in the treatment of faecal incontinence.
 - In patients with faecal incontinence secondary to obstetric anal sphincter damage, rectal irrigations are the first line treatment.
 - In intractable faecal incontinence, disposable anal plugs are successful in all patients.
 - Patients with severe faecal urgency are always managed with a stoma.
- Disruption of the external anal sphincter muscle is
 - clinically recognised after 5% of vaginal deliveries.
 - more common after forceps delivery.
 - associated with an increased risk of faecal incontinence with successive vaginal deliveries.
- Faecal incontinence
 - is more common in men than in women.
 - increases with age.
 - refers only to incontinence of gas.

- is recognised in 10%–30% of women immediately after vaginal delivery.
- In treatment of faecal incontinence
 - conservative treatment is successful in nearly 50% of patients.
 - anal sphincter repair is the first line of treatment for all patients.
 - infection is the commonest complication in graciloplasty.
 - sacral nerve neuromodulation has been used in patients with failed sphincter repair.

A copy of the bowel symptom diary is available online (<http://www.postgradmedj.com/supplemental>).

Authors' affiliations

S Maslekar, A Gardiner, C Maklin, G S Duthie, University of Hull, Academic Surgical Unit, Castle Hill Hospital, Cottingham, UK

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ANSWERS

1. (A) T, (B) F, (C) F, (D) F; 2. (A) F, (B) T, (C) T; 3. (A) F, (B) T, (C) F, (D) T; 4. (A) T, (B) F, (C) T, (D) T.