

# Faecal incontinence

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**Background:** Faecal incontinence is a life style-limiting condition with multiple aetiologies. Surgical cure is not often possible.

**Methods and results:** A review of the literature was undertaken using Medline, Cochrane database and standard textbooks. Advanced imaging techniques now inform the treatment algorithm and objectively assess success. The long-term outcome of anal surgery is uncertain. Modern approaches favour conservative measures, such as biofeedback, and less invasive surgical procedures. Stoma formation is a definitive option for some patients.

**Conclusion:** Current treatment of faecal incontinence is evolving from a sphincter-focused view to a more holistic one, recognizing the influence of the pelvic floor and psyche in maintaining continence. Modern imaging modalities direct treatment strategies.

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## Introduction

Faecal incontinence remains a common affliction associated with marked social and psychological disability. There are many causes, so comprehensive assessment is paramount. Treatment strategies are aimed at reducing the burden of incontinence so that quality of life is improved and, if definitive treatment is not possible, at helping patients cope with their symptoms. The total economic impact is difficult to quantify as there are both direct costs to the patient and indirect costs to society through utilization of health resources, effects on employment and provision of care home placements. Therapeutic strategies are varied and dependent on local expertise and available facilities. Advances in imaging over the past two decades now complement therapeutic strategy. Another significant advance has been the development of conservative therapies, especially biofeedback. Surgery is now usually considered only when biofeedback has failed<sup>1</sup>. The conservative trend has been further marked by the advent of less invasive procedures, such as sacral nerve stimulation, which have considerably reduced morbidity. A final reason for the increasingly restricted place of invasive surgery is the emerging literature showing poor long-term benefit. The colostomy, once thought to be the last resort, is also increasingly regarded as offering hope for some of the more severely troubled patients.

A literature review was initially conducted using PubMed and the search terms 'faecal' and 'anal incontinence', with subsequent Boolean searches on the various headings in this review. This produced fertile searches of seminal articles, meta-analyses and current reviews whose citations were further cross-referenced. The Cochrane database and textbooks on current opinion were also sought and further cross-referenced.

## Epidemiology and aetiology

The International Continence Society (ICS) collaboration has defined anal incontinence as the involuntary loss of flatus, liquid or stool that is a social or hygiene problem. The definition of faecal incontinence is similar with the exclusion of flatus incontinence<sup>2</sup>. This review deals with the available literature, which comes largely from specialist centres, with an inevitable bias towards patients who are more prepared to present themselves for treatment and away from the elderly residential home population that suffers the greatest prevalence of faecal incontinence<sup>3</sup>.

A recent systematic review of the prevalence of anal and faecal incontinence reported a range of 2–24 per cent and 0.4–18 per cent respectively<sup>3</sup>. Incontinence is commoner in the older population, with one-third of over-65 year olds having symptoms at least once a year. The prevalence is approximately 50 per cent among the

institutionalized, with an annual incidence of 20 per cent developing incontinence<sup>4</sup>. An important measure of severity is its effect on quality of life; over 50 per cent of patients with major faecal incontinence report a significant negative impact on quality of life<sup>5</sup>.

In addition to the age-related differences in prevalence, 63 per cent of affected elderly patients are women<sup>6</sup>. This sex effect relates to the commonest aetiologies, in particular obstetric perineal trauma, which remains the commonest identifiable aetiological factor in young women. Incontinence develops after childbirth in 13 per cent of primigravidas and 23 per cent of multigravidas, with sonographic evidence of injury in 35 and 45 per cent respectively<sup>7</sup>. The risk factors for incontinence are better represented using odds ratios, listed here in descending risk<sup>2</sup>: first delivery, 9.8; forceps, 4.8; vacuum delivery, 3.5; multiparity, 3.4; Asian race, 3.2; and baby's weight over 4 kg, 2.2. Older maternal age is not a significant risk<sup>2</sup>. Patients may have occult injuries and remain asymptomatic for some time; a longitudinal study showed that those who developed transiently impaired continence after a first delivery were at significant risk of developing more permanent symptoms after a second delivery<sup>8</sup>. Importantly, there is no evidence that episiotomy is a prophylactic measure in most deliveries; most randomized trials have shown no benefit apart from reducing the incidence of anterior vaginal tears<sup>9,10</sup>. Trauma to the sphincters may also occur after surgery for haemorrhoids, anal fissure or fistula, and after the infamous Lord's stretch.

The other commonly affected group are those suffering the effects of age, notably sphincter degeneration, sequelae of faecal impaction, stroke, dementia and polypharmacy. Patients with neurological disorders are a discrete group that includes those with spinal injuries and spina bifida, who suffer with evacuation difficulties and/or faecal incontinence depending on the location of the lesion. *Table 1* shows the causes of faecal incontinence.

## Assessment

### Clinical assessment

History gathering requires tact but also a willingness to ask direct questions about the complaint. The type of incontinence may suggest the cause of the problem; passive soiling of stools suggests an internal sphincter or sensory problem, urge incontinence suggests external sphincter or luminal disease. The volume of stool lost and the frequency of episodes of incontinence are important in the assessment of severity. The social history gives insight into quality of life issues. Social, occupational

**Table 1** Causes of faecal incontinence

Trauma
Obstetric*
Iatrogenic*
Anal stretch
Haemorrhoidectomy
Sphincterotomy
Fistula surgery
Colectomy
Pouch procedures
Radical prostatectomy (damage to nerve plexi)
Accidental injury
Impalement injury
Sexual
Anal intercourse (non-consensual more than consensual)
Radiation damage (anal, prostatic and cervical cancer, other pelvic irradiation)
Via direct internal sphincter damage
Via radiation proctitis (and resulting diarrhoea)
Congenital
Imperforate anus
Anal agenesis
Colorectal
Rectal prolapse*
Prolapsing haemorrhoids
Medical cause
Inflammatory bowel disease – related to diarrhoea or perianal disease
Irritable bowel syndrome (diarrhoea predominant)
Coeliac disease – related to diarrhoea
Diabetes mellitus – related to diarrhoea or neuropathy
Multiple sclerosis
Psychiatric illness – behavioural
High BMI – poor toilet hygiene
Debility – poor mobility
Gastrointestinal stimulants
Drugs (any that cause diarrhoea)
Foods (caffeine, alcohol, aspartamine)
Osmotically active foods (lactose, sorbitol, olestra fat substitute)
Neurological
Spinal cord trauma
Meningocele/myelomeningocele
Spina bifida*
Urogynaecological
Pelvic organ prolapse*
Associated with urinary incontinence
Cognitive impairment
Dementia
Stroke
Learning disability
Degenerative
Internal anal sphincter degeneration*

\*Commonest causes. BMI, body mass index.

and sexual dysfunction may result, secondary to loss of confidence. Precipitating factors should be elicited and any obstetric history should focus on the predictive factors for incontinence discussed above. Symptoms of other pelvic floor problems (urinary incontinence and pelvic organ prolapse), which have similar risk factors, should be elicited;

no less than 20 per cent of faecally incontinent patients have such symptoms<sup>11</sup>.

Clinical examination should check for perianal excoriation and dermatitis from prolonged exposure to faeces, and for a patulous anus. Perineal scarring, small perineal body size and a wide genital hiatus suggest obstetric trauma. Evidence of excessive pelvic floor descent or pelvic organ prolapse on straining while supine or on a toilet (for rectal prolapse) should be sought sensitively. Vaginal examination using a Simms speculum may show a rectocele, cystocele and/or uterine prolapse. Digital rectal examination for sphincter bulk, tone and squeeze gives a basic impression of sphincter function.

Disease severity and quality of life are often linked but they need not be proportional and depend on the patient's psychological profile. Disease-specific questionnaires have been evaluated by the ICS and, although no 'highly recommended' instrument has been identified, the Faecal Incontinence Quality of Life Scale, Manchester Health Questionnaire, and Birmingham Bowel and Urinary Symptom Questionnaire are recommended<sup>5</sup>.

## Physiological assessment

### *Anorectal physiology*

This continues to be the 'gold standard' for defining sphincter function. A comprehensive review of the methodologies available is found in the American Gastroenterological Association technical review<sup>12</sup>. In brief, anal manometry allows assessment of resting anal tone (primarily a reflection of internal sphincter function), voluntary and involuntary squeeze (reflecting external sphincter function) and other more controversial aspects of sphincter function, such as functional anal canal length and endurance squeeze pressure. In addition to motor testing, aspects of anorectal sensation can be evaluated. Rectal distension sensitivity allows assessment of threshold, urge and maximum tolerated volumes. More sensitive assessment of rectal sensitivity and compliance can be obtained using a barostat in selected patients (after ileoanal pouch formation). Anorectal electrosensitivity is an indicator of the integrity of hindgut innervation and has a place in patients with a putative neurological aetiology for their incontinence. In addition to defining the presence and extent of sphincter dysfunction, anorectal physiology testing may form the basis of biofeedback training<sup>13</sup>.

### *Electromyography*

This technique is little used in clinical practice nowadays. In terms of identifying a localized sphincter defect, it has been superseded by the advent of endoanal ultrasonography.

Single-fibre electromyography does have some value in the recognition of neurogenic anal sphincter lesions<sup>14</sup>.

### *Pudendal nerve terminal latency*

This controversial technique is intended as a measure of pudendal nerve integrity in putative 'neurogenic' incontinence. It is poorly reproducible owing to problems with operator dependence, body habitus and the fact that the test measures conduction of the fastest-velocity fibres, which are the most sensitive to minor injury<sup>15</sup>. Most importantly, the presence of prolonged latencies does not predict the outcome of therapy or show permanency<sup>8</sup>.

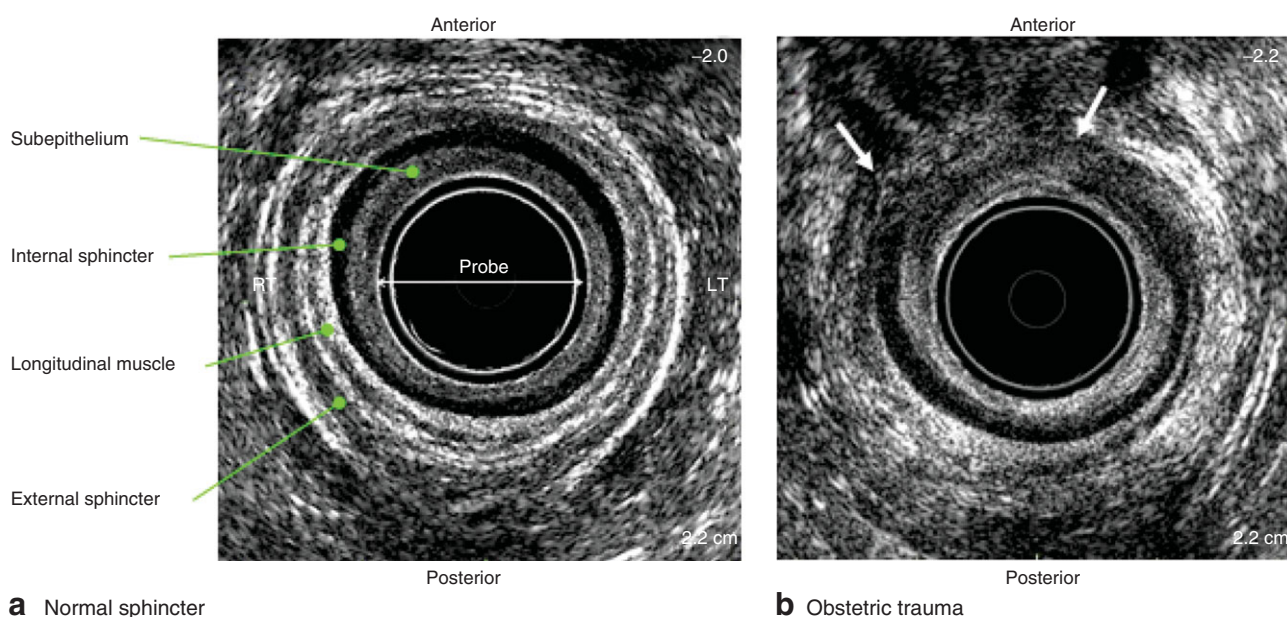
## Structural assessment

Endoanal imaging has gained worldwide acceptance in the management of faecal incontinence. Ultrasonography and magnetic resonance imaging (MRI) can now give high-resolution images that define sphincter injury with good specificity and sensitivity<sup>16</sup>. Combined with anorectal physiology, imaging provides an integrated assessment of sphincter function.

Endoanal ultrasonography (EAUS) is invaluable in identifying structural injury with excellent intraobserver and interobserver reliability. It accurately identifies injuries to both the internal and external sphincters (*Fig. 1*), and also informs on the quality of the internal sphincter, in particular identifying atrophy. EAUS has a central role in the algorithm for deciding suitability for surgery (*Fig. 2*). The advent of three-dimensional EAUS may further improve diagnostic capabilities, by showing the radial and linear extent of injuries to the sphincter complex as well as atrophy, and by providing better visualization of the support structures such as the puborectalis, transverse perineii and puboanalis<sup>17,18</sup>.

Endoanal MRI is more sensitive for imaging the external anal sphincter, partly owing to the contrast it provides between fat and striated muscle. Its usefulness lies in visualizing external anal sphincter injuries that are difficult to define on endosonography and in recognizing sphincter atrophy highlighted by fatty infiltration<sup>19</sup>. Endoanal MRI has provided recent evidence that puborectalis atrophy may be causative in some patients with 'idiopathic' faecal incontinence<sup>20</sup>. Endoanal imaging is particularly useful in identifying suitability for surgery or even reoperation, as it identifies persistent defects and sphincter atrophy; both factors are associated with poor surgical outcome<sup>19,21</sup>.

In addition to faecal incontinence some patients may have evacuation difficulties as part of a global pelvic floor problem. This is appropriately investigated using barium proctography, which highlights the descent, relaxation



**Fig. 1** Endoanal ultrasonographic images showing **a** normal sphincter structure, and **b** an anterior external and internal sphincter tear (arrows) after obstetric trauma

and contraction of the pelvic floor, and the presence of a rectocele and its characteristics (size and emptying). This last item is useful to know as it may produce a sump effect with impaction and consequent overflow. Dynamic MRI and magnetic resonance proctography are other useful ways of visualizing the pelvic compartments, including the posterior compartment. The identification of double- or triple-compartmental dysfunction affects treatment, particularly if surgery is contemplated in patients with combined urinary and faecal incontinence plus prolapse.

### Treatment

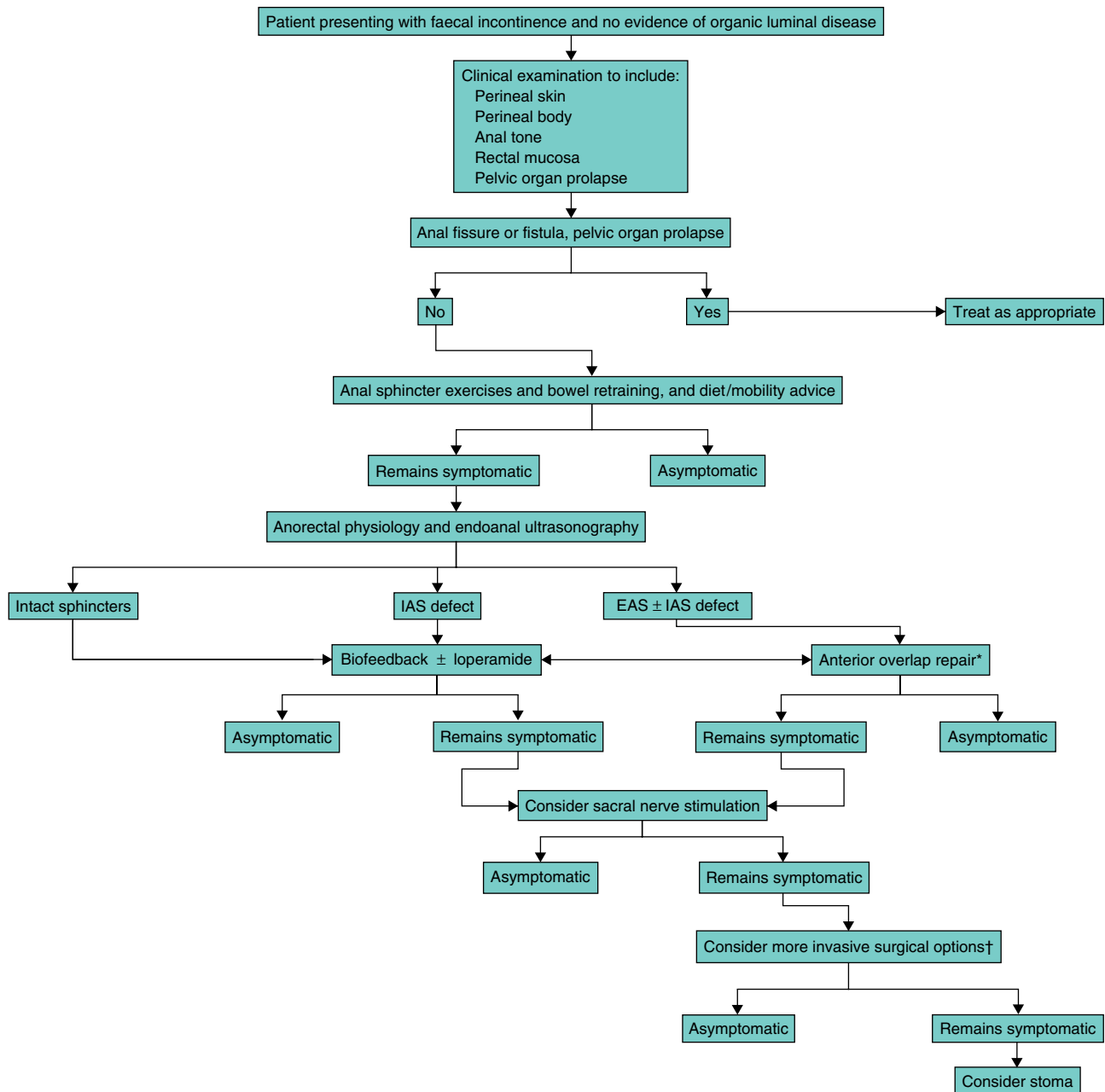
Surgery has generally been reserved for severe incontinence. With the recognition that severity is subjective, treatment should be allocated according to symptom profile and patient lifestyle. Part of management is identifying exacerbating or contributing factors. Exclusion of gut stimulants such as caffeine, nicotine, alcohol and artificial sweeteners can be helpful. Patients are often counselled on fluid and fibre intake but there is little evidence of benefit, except in the elderly with overflow. General measures on hygiene and pad usage may seem trivial, but they are essential in helping patients cope; continence advisory services can be extremely helpful in this regard. Skin protection is also important, as even minor leakage can lead to excoriation and ulceration. The treatment, as with nappy rash, is gentle cleaning with a moist cloth and use of

appropriate absorptive pads. Adhesive barrier creams and sprays also lend protection. Coping with odour and soiling is difficult. For minor leakage, a cotton wool pledget at the anal orifice might protect from minor seepage during the day. For those with mild passive leakage and low stool frequency an anal plug may help, but this is primarily of use in patients with a neurological deficit as others experience significant discomfort.

### Drugs

#### Loperamide

Loperamide is a synthetic opioid with  $\mu$ -agonist activity and coincidental calcium channel blocking actions. By slowing gut transit, increasing fluid reabsorption and reducing secretion<sup>22,23</sup>, loperamide thickens stool consistency and reduces stool frequency. It also has direct sphincter actions, attenuating the anorectal inhibitory reflex and increasing resting anal pressure<sup>24</sup>. It is at least as effective as codeine and superior to diphenoxylate in chronic diarrhoea, with a tendency to reduce faecal incontinence more effectively than the other agents<sup>25</sup>. The availability of a syrup formulation offers the opportunity of titrating the dose more finely to avoid the side-effect of constipation. Some authors advocate using the drug before meals to reduce postprandial bowel urgency. Tolerance does not seem to develop with chronic administration, and the safety profile is excellent with both regular and as-required use.



**Fig. 2** Closed clinical pathway for patients presenting with non-faecally impacted, neurologically intact faecal incontinence. \*Consider if there is a repairable defect or large persistent defect after repair. †Invasive options include antegrade colonic enema, bioinjectables, SECCA® procedure, dynamic graciloplasty or artificial bowel sphincter. IAS, internal anal sphincter; EAS, external anal sphincter

### Opiates

Diphenoxylate, a natural opioid, is usually combined with atropine (co-phenotrope or Lomotil®; Goldshield Pharmaceuticals Ltd, Croydon, UK) to reduce abuse potential. It crosses the blood–brain barrier to produce central nervous system side-effects and, when combined

with atropine, can cause anticholinergic effects. It is less effective than loperamide<sup>25</sup>. Codeine phosphate is another opiate derivative, with side-effects of nausea, tolerance and dependence. Its clinical effects are similar to those of loperamide, but it is harder to titrate and adverse effects become prominent with time<sup>25</sup>.

*Amitriptyline*

Low-dose amitriptyline (10–50 mg per day) reduces bowel frequency and secondary incontinence episodes<sup>26</sup>, possibly by reducing high-amplitude rectal contractions. This effect does not occur with the newer antidepressants, such as the serotonin re-uptake inhibitors or serotonin and noradrenaline re-uptake inhibitors, which may actually predispose towards faecal incontinence.

*Phenylephrine cream*

Phenylephrine is an  $\alpha$ 1-adrenergic agonist. When applied topically it increases resting anal canal pressure in normal individuals, but it does not seem effective in the treatment of idiopathic faecal incontinence<sup>27</sup>. It may have a place in treating incontinence associated with ileoanal pouches (when the sphincters tend to be intact)<sup>28</sup>. The preparation is poorly tolerated owing to allergic contact dermatitis.

*Other drugs*

A number of other agents (sodium valproate, sucralfate, bismuth, alosetron) have been trialled based on the premise of increasing internal anal sphincter tone and/or reducing colonic motility and secretion, but with little success. Drugs can be combined for synergistic effect, helping reduce individual doses; loperamide plus codeine phosphate and loperamide plus amitriptyline are examples.

**Biofeedback**

Biofeedback is a form of 'operant conditioning' that can be directed towards pelvic floor retraining, with visual or auditory feedback to encourage sphincter synchrony and strength exercises. The principle involves giving feedback about subconscious bodily functions to enhance control of those functions. It has been used for incontinence of varying severity and type, both as an adjunct to surgery and also after failed surgery. Techniques vary between centres but the common aim is to improve muscular strength and coordination, feedback being provided by anal manometry, surface electromyography or endoanal ultrasonography. This muscle retraining can be combined with sensory biofeedback, using balloon distension to desensitize the rectum progressively to small volumes and hence improve urge resistance. A part of this exercise is to modify behaviour and reduce the panic that enhances urgency. Adjuvant anal electrical stimulation to sensitize the rectum and induce muscular contraction does not enhance the response compared with sham stimulation<sup>29</sup>.

Patients are sometimes instructed in rectal retrograde irrigation using an irrigating cone or a Shandling catheter,

working on the premise that an empty rectum should not leak. This has mainly been used in children with spina bifida and those with mild soiling. Treatments may be combined, for example biofeedback with titrated loperamide or rectal irrigation with loperamide, to tide patients over the period when leakage is most likely. Adjunctive hypnotherapy may also help reduce incontinence episodes<sup>30</sup>.

A systematic review has shown that biofeedback cures up to half and improves up to two-thirds of patients<sup>31</sup>. The mechanism of action remains unclear; three randomized studies comparing biofeedback techniques have shown no difference between simple advice and invasive techniques<sup>32–34</sup>. The suggested common thread is patient–therapist interaction and the psychological support given. As with surgery, patient selection is paramount. Patients require both insight into their problem and motivation to complete the programme, particularly those requiring behavioural modification.

**Surgical intervention***Postanal repair*

This old treatment for idiopathic faecal incontinence is intended to restore the anorectal angle and recreate the flap valve mechanism by posterior plication of the levator, puborectalis and external anal sphincter. However, radiological studies have failed to show an association between function and improvement<sup>35</sup>, and long-term results suggest that less than a quarter of patients are continent at 6 years<sup>36</sup>. As a result, the operation has fallen out of favour and is now performed only at the time of perineal proctectomy for rectal prolapse in order to restore the anorectal angle.

*Sphincter repair*

Approximately one-third of all primiparous vaginal deliveries result in an anal sphincter tear (only a third of these cause symptoms) and every subsequent delivery is associated with a 8.5 per cent risk of sphincter injury<sup>37</sup>. This figure is independent of the 1 per cent risk of a third-degree tear with any delivery<sup>6</sup>. In the short term, repair improves continence scores in approximately two-thirds of patients, similar results being obtained by an overlapping or end-to-end technique<sup>38</sup>. However, long-term follow-up indicates that no patients remain completely continent and most remain severely socially restricted<sup>39</sup>. Predictive factors for poor outcome are advanced age at the time of sphincter injury, a fourth-degree tear, a persistent postoperative defect and operator experience<sup>37</sup>. There is no relationship between outcome and presence of pudendal

nerve terminal motor latencies, arguing against their use in patient selection. EAUS can identify patients with a persisting defect and some may benefit from repeat sphincter repair<sup>40</sup>. When repair fails, adjuvant biofeedback can improve functional outcome<sup>41</sup>.

A difficulty arises in the antepartum prediction of who will develop sphincter trauma, as many of the risk factors are dependent on features intrapartum. Patients with occult defects are at risk of further injury with subsequent deliveries. Thus careful screening by EAUS and anorectal physiology of high-risk asymptomatic patients or those with transient symptoms is advisable as caesarean section may, arguably, provide secondary prevention<sup>42</sup>. Long-term studies addressing this issue are awaited.

#### *Injectable bulking agents*

This is an evolving treatment and the indications are not yet clearly established. The intention is to facilitate closure of the anal canal by creating a better seal; however, no changes in anal canal pressures have been clearly demonstrated. Typically the agent is injected submucosally to create a bulking effect to augment a deficient internal sphincter causing passive incontinence. It has also been used to 'plug' isolated defects in the internal and external anal sphincters. A number of materials have been used, including synthetic agents (silicone (Bioplastique®; Uroplasty BV, Geleen, The Netherlands), carbon-coated zirconium oxide beads (Durasphere®; Boston Scientific, Natick, MA, USA)) and biological tissues (autologous fat, bovine or porcine collagen (Contigen®; Bard, Covington, GA, USA and Permacol®; Tissue Science Laboratory, Aldershot, UK, respectively)). Unfortunately, irrespective of the material used, initial responses appear short lived.

Autologous fat was the first injectable agent in faecal incontinence but the risk of fat embolism has limited its use. Bioplastique®, used for internal sphincter defects, although modestly beneficial at 6 weeks in 60 per cent of patients, remains effective in only 29 per cent at 6 months<sup>43</sup>. Use of the larger molecule Durasphere® to limit migration improves continence at 1 year, success being positively correlated with the number of sites injected<sup>44</sup>.

Complications are relatively rare, but potentially serious. Ulceration and pain, migration of agent, technical difficulties (backflow of agent, difficulty in accurate placement) and need for repeated treatments all predispose to sepsis. Other potential severe side-effects include systemic dissemination with granuloma formation at distant sites, pulmonary fat embolism, the possibility of disease transmission (such as prions in bovine collagen) and antigenicity<sup>45</sup>.

#### *SECCA® procedure*

This is allied to the STRETTA® (Curon Medical, Fremont, CA, USA) procedure used for treating gastro-oesophageal reflux. The principle involves the use of radiofrequency energy, delivered by electrodes inserted deep to the muscularis mucosa, to create a heating effect that causes tissue fibrosis and scarring. Two published studies of 60 patients with a variety of sphincter injuries followed for up to 2 years have reported modest or better improvements in continence scores without changes in anal manometry findings<sup>46,47</sup>. Complications are delayed bleeding, mucosal ulceration, transient worsening of incontinence and anal pain. These short-term results, although promising, require long-term and randomized data to identify specific patient groups that might benefit.

#### *Sacral nerve stimulation*

This has rapidly gained popularity and has demonstrated effectiveness in faecal, as well as in urinary, incontinence. In November 2004 the National Institute for Clinical Excellence in the UK approved the procedure for patients with idiopathic faecal incontinence. An advantage of the technique is its relative absence of complications and it has repeatedly been demonstrated to improve quality of life. The mechanism of action is poorly understood but is thought to involve afferent neuromodulation as much as facilitation of rectal and anal sphincter motility. Positron emission tomography studies of sacral nerve stimulation in patients with urinary symptoms have also raised the possibility of an effect on central efferent pathways.

A systematic review has shown that 75–100 per cent of incontinent patients are improved, with 41–75 per cent becoming completely continent at 1–99 months<sup>48</sup>. This effect is maintained at 2 years, with mean values of incontinence episodes falling from a baseline of 16 per week to three and two per week at 1- and 2-year follow-up respectively<sup>49</sup>. It is perhaps the only surgical procedure that maintains effects in the long term. It is of benefit to patients with a range of aetiologies of incontinence, including mixed sphincter injuries, combined urinary and faecal incontinence, and partial spinal injuries. Its possible benefit in those with sphincter defects<sup>50</sup> gives some hope of using it as a salvage procedure after failed surgical treatment. The drawback of cost is offset by the option of a 2-week peripheral nerve evaluation phase that allows selection of patients who show a good response.

#### *Dynamic graciloplasty*

This invasive sphincter-augmenting procedure is reserved for those with failed conventional treatments and those who have an irreparable sphincter. It involves mobilization

of the gracilis muscle, which is then wrapped around the native sphincter and attached to the contralateral ischial tuberosity. The muscle can be either stimulated or unstimulated; continuous low-voltage stimulation converts fast-twitch fatiguable muscle to slow-twitch non-fatiguable sphincter-like muscle. Numerous modifications have been made, including using both gracilis muscles to create a bilateral wrap and the use of gluteus maximus transposition.

Results are markedly operator dependent, but enthusiasts for the procedure report overall success in up to 72 per cent, with outcome best in patients with obstetric trauma (82 per cent) and worst in those with congenital anorectal malformation (52 per cent)<sup>51</sup>. Complications are common and may be serious, including evacuation difficulties (16 per cent), infection (12 per cent), pain (8 per cent), neuromodulator displacement (6 per cent) and anorectal perforation (5 per cent) – and death occurs in 1 per cent<sup>52,53</sup>. Caution must be exercised in those with coexistent evacuation difficulties.

#### *Artificial sphincter*

This is also reserved for end-stage faecal incontinence when all other methods have failed. However, for a salvage procedure, it is costly and associated with a high morbidity rate. Results are variable, with poorly standardized, non-randomized studies containing mainly small numbers of patients. Overall, 87 per cent have device-related complications, with infection rates of 9–58 per cent (mainly *Staphylococcus aureus* and methicillin-resistant *S. aureus*), erosion in 6–25 per cent (which often accompanies infection), evacuation difficulties with faecal impaction in 6–85 per cent, and chronic pain in 4–17 per cent. Almost 50 per cent of patients require revisional surgery, mainly secondary to infection, device malfunction and evacuation difficulties<sup>54</sup>. At 1 year 35 per cent will have had the device removed, rising to 50 per cent at 7 years<sup>55,56</sup>. The device seems to be better at controlling solid rather than liquid incontinence.

#### *Antegrade irrigation*

The Malone antegrade continence enema was developed in children with intractable faecal incontinence secondary to spina bifida to allow irrigation of the colon via the appendix, which was brought out as a stoma. Modifications have been made, including use of a laparoscopic approach, insertion of a caecostomy tube under fluoroscopic guidance, or a combination of both. In adults, it has been used for both constipation and incontinence, and also in adult spina bifida and spinal injuries; the numbers are small but good satisfaction rates have been reported<sup>57</sup>. Percutaneous endoscopic colostomy, which involves use of a more distal

irrigation site, is meant to use smaller amounts of irrigant and be less time consuming. Complications include wound infection, necrosis, granulation, stomal stenosis, stricture, difficulty in catheterizing the stoma, mucous discharge at the stoma site, abdominal discomfort during irrigation, bowel obstruction and ultimately loss of response to irrigation<sup>57,58</sup>.

#### *Stoma*

This is often regarded as a procedure of last resort, although increasingly it is being considered earlier in the course of incontinence management given the poor results of some of the invasive procedures already described. Some 84 per cent of patients who have undergone stoma formation for faecal incontinence would choose to have it again and recommend it to a friend, and 83 per cent report little or no restriction caused by the stoma<sup>59</sup>. Stoma formation is also an important option in patients with neurogenic incontinence, such as in chronic spinal injury or spina bifida. Many surgeons offer a laparoscopically assisted end colostomy. All treatments considered, a case can be made for stoma formation as a first surgical option as it gives the patient control and allows functional continence.

### **Special groups**

#### *Faecal impaction*

Fifty-two per cent of institutionalized patients and 42 per cent in geriatric units have faecal impaction. Simple measures, such as regular enemas and lactulose, are helpful in 90 per cent<sup>60</sup>. An alternative strategy, which achieves continence in 75 per cent, is a regimen of daily codeine phosphate and twice-weekly enemas<sup>61</sup>. Contributory factors, such as drug side-effects, immobility and dehydration, should be corrected where possible. Regular toileting and bowel programmes similar to those for spinal injury are required for the bed bound or infirm. Potential complications of incontinence should be addressed. Intensive nursing, air mattresses and regular turning may prevent pressure sores, and skin protection can be provided by barrier creams and sprays; management of co-existent urinary incontinence may also be needed.

#### *Spinal injuries and neurological disorders*

Spinal injuries can be partial or complete, supraconal or cauda equina, and all can cause faecal incontinence. Spinal reflexes are disinhibited in patients with high injuries, resulting in increased sphincter tone in response to increases in intra-abdominal pressure, and reflex sphincter relaxation in response to digital stimulation. Faecal incontinence here is due to sphincter incoordination with

periods of reflex relaxation with small rectal volumes. For cauda equina (lower motor neurone) injuries, the sphincter is hypotonic and unresponsive, leading to a capacious rectum with the sequelae of faecal impaction and overflow and a need for manual evacuation<sup>62</sup>.

Incontinence may also result from impaction with overflow when management should involve programmes to maintain regular, planned bowel evacuation using a combination of diet and lifestyle modification, titrated laxatives and rectal evacuation techniques. This starts with simple measures, such as adequate fluid and dietary fibre, and facilitating transfers on to the toilet and defaecatory positioning in the seated position, knees above hips. Timing of defaecation on waking or after meals is often helpful. Use of the Valsalva manoeuvre and abdominal massage may facilitate expulsion. Stool softeners and rectal stimulants, such as bisacodyl and glycerine, and small-volume enemas ease evacuation. Digital stimulation helps the hyper-reflexic sphincter and, for more difficult situations, retrograde irrigation using a Shandling catheter is useful; this is particularly so in those with spina bifida, but poses difficulty in those with limited mobility. A stoma can give independence and functional continence to many patients<sup>63</sup>. Neuromodulation also has promise, in that patients using sacral anterior root stimulation via a Brindley implant (used initially to improve bladder function) often have improved bowel function<sup>64</sup>. In particular, stimulation reduces rectal spasms and improves rectal compliance, helping to normalize bowel habit and reduce time spent on bowel management. Sacral nerve stimulation has also been shown to help in patients with incomplete injuries<sup>65</sup>.

## Overview

Biofeedback is an all-encompassing conservative treatment in which simple advice may be as beneficial as more involved sensorimotor feedback techniques. Patients considering complex surgical procedures must be aware of the complications and long-term outcomes; they should have realistic expectations, as operations for end-stage incontinence are often disappointing. Less invasive procedures show some promise and are the focus of future therapies. Imaging and anorectal physiological studies inform the treatment algorithm shown in Fig. 2 and objectively assess success. Finally, notable advances have been a change in perspective when treating faecal incontinence, from a rather blinkered concern about the sphincter to a more holistic approach involving the pelvic floor, rectum, colonic transit and, most importantly, psychological wellbeing.

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