Biofeedback for pelvic floor dysfunction in constipation

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Pelvic floor dyssynergia is one of the commonest subtypes of constipation, and the conventional treatment (dietary fibre and laxatives) is often unsatisfactory. Recently biofeedback training has been introduced as an alternative treatment. The authors review the evidence for this approach and conclude that, although controlled studies are few and open to criticism, about two thirds of patients with pelvic floor dyssynergia should benefit from biofeedback training

Chronic constipation is a common self reported gastrointestinal problem that affects between 2% and 34% of adults in various populations studied. Among the subtypes of constipation, obstructed defecation seems particularly common, occurring in about 7% of the adult population.¹ In most people with this condition an inappropriate (paradoxical) contraction or a failed relaxation of the puborectal muscle and of the external anal sphincter often occurs during attempts to defecate (fig 1). This paradoxical contraction of the pelvic floor muscles during straining at defecation is considered a form of maladaptive learning and is generally defined (without specifying the underlying pathophysiological mechanism) as outlet dysfunction constipation or, more precisely, pelvic floor dyssynergia.²

Cardinal symptoms of pelvic floor dyssynergia are straining at stools and feelings of incomplete evacuation, and the diagnostic criteria, recently updated in the Rome II report, include those for functional constipation (see box)³ plus at least two out of three investigations (radiology, manometry, and electromyography) showing inappropriate contraction or failure to relax the pelvic floor muscles during attempts to defecate.²

Fig 1 Anorectal manometric tracings of a normal subject (upper tracing) and a patient with pelvic floor dyssynergia (lower tracing) during straining at defecation (arrows). Note that the normal subject relaxes the anal sphincter, whereas the patient displays a paradoxical contraction of the sphincter

Summary points

Obstructed defecation is a common subtype of constipation that may not be responsive to treatment with laxatives and dietary fibre

Failure of the pelvic floor and anal muscles to relax during straining (pelvic floor dyssynergia) seems to be the commonest cause of obstructed defecation

Biofeedback to teach patients to inhibit this paradoxical behaviour has been proposed as an effective treatment

Biofeedback is reported to benefit more than half of patients with evidence of pelvic floor dyssynergia, but mechanisms of action are still unclear and controlled studies are lacking

The rationale of using biofeedback in pelvic floor dyssynergia

The common treatment for chronic constipation is with high dietary fibre and laxatives. However, some patients (and especially those with pelvic floor dyssynergia) are unresponsive to these measures, which has encouraged the use of alternative treatments such as biofeedback training.⁴ Biofeedback is thought to be appropriate when specific pathophysiological mechanisms are known, and the control of relevant responses can be learnt with the aid of systematic information about a function that is not usually monitored consciously.⁴ We have critically reviewed the evidence on use of biofeedback to treat pelvic floor dyssynergia.

Methods

We made a comprehensive online search of Medline and the Science Citation Index using the keywords

Details of extra references w1-w8 appear on bmj.com

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“biofeedback,” “constipation,” and “pelvic floor dyssynergia” in various combinations with the Boolean operators *and*, *or*, and *not*. We included only articles that related to human studies, and we performed manual cross referencing. We selected articles published in English between January 1965 and September 2003, but a search in non-English languages and among journals older than 1965 was also performed in our library. We excluded letters, and we reviewed abstracts only when the full papers were unavailable.

Biofeedback techniques for treating pelvic floor dyssynergia

Paradoxically increased anal pressure or electromyographic activity during straining is readily detected in patients with pelvic floor dyssynergia.⁴ Some authors have measured the pressure gradient between the rectum and the anus on straining, but its clinical relevance is unclear.⁵ Radiological examination of rectal evacuation (defecography) has shown that pelvic floor dyssynergia is associated with the contour of the puborectal muscle increasing or the anorectal angle decreasing (fig 2). In addition, the suspicion of impaired defecation may be confirmed by the patient's inability to expel a rectal balloon. The diagnostic relevance of other techniques (ultrasonography, evacuation scintigraphy, pelvic floor magnetic resonance imaging, etc) is under evaluation.

The three main biofeedback techniques used to treat pelvic floor dyssynergia are sensory training, electromyographic feedback, and manometric feedback.⁶ However, it should be remembered that measurements of pelvic floor dyssynergia may vary in different situations, likely to be minimal during home ambulatory monitoring and maximal under laboratory conditions.¹¹ Some authors provide additional sensory retraining to lower defecation threshold by means of progressively reducing the distension volume of a rectal balloon.⁵ The use of rectal sensory retraining is well standardised in faecal incontinence,⁷ but its clinical relevance in constipation is not yet confirmed.

Fig 2 Representative defecographic sequence of a patient with pelvic floor dyssynergia, showing insufficient opening of the anal canal and of the anorectal angle, with most of the contrast medium retained after straining. The sequence shows resting (upper left), contracting (upper right), straining (lower left), and after straining (lower right)

Rome II criteria for constipation

Adults

- Two or more of the following for at least 12 weeks (not necessarily consecutive) in the previous 12 months: Straining in $\geq 25\%$ of bowel movements
- Lumpy or hard stools in $\geq 25\%$ of bowel movements
- Sensation of incomplete evacuation in $\geq 25\%$ of bowel movements
- Sensation of anorectal obstruction or blockage in $\geq 25\%$ of bowel movements
- Manual manoeuvres to facilitate $\geq 25\%$ of bowel movements
- Fewer than three defecations a week
- Loose stools not present, and insufficient criteria for irritable bowel syndrome

Children

- Pebble-like, hard stools for most bowel movements for ≥ 2 weeks
- Firm stools less than two times a week for ≥ 2 weeks
- No evidence of structural, endocrine, or metabolic disease

Sensory training was the first biofeedback technique to be used in clinical practice. It entails simulated defecation by means of a water filled balloon introduced in the rectum; this is then slowly withdrawn, while patients are asked to concentrate on the sensations evoked by the balloon and to try to ease its passage.⁸ Variations of this technique involve defecation of a balloon or simulated stools to improve defecatory dynamics.⁹

Electromyography consists of recording a patient's averaged electromyographic activity from the pelvic floor muscles for training.¹⁰ Measurements may be obtained from intraluminal probes or from surface electrodes taped to the perianal skin. By watching the recording, the patient first learns to relax the pelvic floor muscles during attempts to defecate, and then gradually increases straining efforts to increase intra-abdominal pressure while keeping the pelvic floor muscles relaxed.⁶

Manometry—Anal canal pressure can also be measured (by means of balloons, perfused catheters, or solid-state probes) to detect the contraction and relaxation of the pelvic floor muscles.⁵ The training procedures are almost identical to those described above for electromyographic training.

Few studies have compared the different biofeedback protocols. No differences were reported between electromyographic biofeedback and simulated defecation in one study,¹¹ whereas a recent meta-analysis showed that the mean success rate with manometric biofeedback was superior to that with electromyographic biofeedback (78% *v* 70%).¹² No differences were found between different electromyographic techniques.

Effectiveness of biofeedback in treating pelvic floor dyssynergia

Literature reviews conclude that more than 70% of adult patients complaining of pelvic floor dyssynergia are likely to benefit from biofeedback training,⁶ and so this is the treatment of choice for the problem. Unfortunately, most data on the outcome of biofeedback in

Patient's personal account

I am a 26 year old single woman. I never suffered from major diseases, but I used to be constipated since childhood. I took it for granted, since all my family's women are also constipated. When I felt the morning call to stools I went to the toilet, but I had to strain hard to expel some little pellets. I often had to sit on the toilet for about half an hour to empty my bowel. If I did not succeed, I felt bloated the whole day, and the call to stools went on and on.

I tried many laxatives without satisfaction; enemas worked a bit better, but sometimes I had difficulties even emptying liquid stools. Fibre did not help and increased bloating. After organic disease was excluded, I was sent to Dr Chiarioni, who diagnosed pelvic floor dyssynergia by means of an anorectal manometry. He explained me that my problem was related to the paradoxical closure of the anal canal on straining. Then I was instructed to inhibit this behaviour by electromyographic biofeedback. The treatment worked well, and now I evacuate once a day with ease. I was surprised and pleased by this chance of self healing my problem.

pelvic floor dyssynergia come from single group, uncontrolled studies, often with different selection criteria for patients.^{1 6} Few controlled studies have been done, mainly in children.

Biofeedback in children—A study of children with faecal incontinence, 18 of whom had pelvic floor dyssynergia, compared manometric biofeedback with mineral oil.¹³ Although there was a trend toward greater improvement with biofeedback for the children with pelvic floor dyssynergia, no significant differences were found. In another study, on children with pelvic floor dyssynergia, manometric and electromyographic biofeedback produced significantly greater improvement than conventional treatment (laxatives).¹⁴ However, two other paediatric studies comparing biofeedback with laxatives failed to find any benefit with biofeedback treatment,^{15 16} although one of the studies also included children without pelvic floor dyssynergia.¹⁵ A recent investigation in constipated children that compared biofeedback training with conventional treatment showed that biofeedback was effective in the short term,¹⁷ but no clear evidence for long term benefits was reported.

Biofeedback in adults—The few controlled studies done include small numbers of patients, too few to draw firm conclusions. One study of patients with pelvic floor dyssynergia reported that 90% of those treated by intra-anal electromyographic biofeedback improved compared with 60% of those given balloon defecation training.¹⁸ A second study, of constipated patients (two thirds with pelvic floor dyssynergia), compared electromyographic biofeedback training to defecate a balloon with balloon defecation training without visual feedback and showed no difference in efficacy between treatments (69% *v* 64%).¹⁹ Another study compared four biofeedback approaches (electromyographic training alone, electromyography plus rectal balloon defecation, electromyography plus daily use of a home biofeedback trainer, and the above combined); it found no differences between groups, but the first three groups showed a significant decrease in the use of laxatives and all but the third group showed a significant increase in the frequency of spontaneous bowel movements.²⁰

Long term efficacy of biofeedback and predictors of outcome

The few studies with long term follow up data are uncontrolled and often include patients with various subtypes of constipation. Most studies on biofeedback training report good short term efficacy, mirrored by an improved psychological state and quality of life,²¹ whereas the few follow up studies indicate a fading effect over time.^{22 w2} However, a certain percentage of patients (up to 50% and more) continued to report satisfaction even at 12-44 months after treatment.^{23 w3}

The various biofeedback protocols used make it difficult to assess those factors that affect outcome, and this is exacerbated by the lack of proper definition of such factors. Manometric demonstration of paradoxical sphincter contraction during straining does not seem to predict response to biofeedback, and the success of this treatment seems to be related to the number of training sessions.²⁴ Anatomical factors and the presence of significant psychological symptoms (such as affective disorders, distorted attitudes about food, and history of sexual abuse) may also play a role.^{23 w4 w5} The size of improvement in anorectal pressure gradient, or in anal electromyographic activity on straining, does not seem to be relevant to treatment outcome.¹² Similarly, the association of a colon motility disorder (so called slow transit constipation) with pelvic floor dyssynergia does not seem to affect the clinical outcome,^{w3} although recent evidence indicates that biofeedback treatment benefits only constipated patients with functional evidence of pelvic floor dyssynergia (Chiarioni G, Salandini M, Whitehead WE. Digestive Disease Week, San Francisco, 19-22 May 2002. Abstract book: A-123).

Additional educational resources

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Brazzelli M, Griffiths P. Behavioural and cognitive interventions with or without other treatments for defaecation disorders in children. *Cochrane Database Syst Rev* 2001;(4):CD002240

Diamant NE, Kamm MA, Whitehead WE. AGA technical review on anorectal testing techniques. *Gastroenterology* 1999;116:735-60

Drossman DA, Corazziari E, Talley NJ, Thompson WG, Whitehead WE, eds. *Rome II: the functional gastrointestinal disorders*. McLean, VA: Degnon Associates, 2000

Useful websites for patients and physicians

National Digestive Diseases Information Clearinghouse (NDDIC) (<http://digestive.niddk.nih.gov/ddiseases/pubs/constipation/index.htm>)—Simple, easy to read information on the main aspects of constipation, including treatments

BIOME, OMNI (<http://omni.ac.uk/browse/mesh/detail/C0009806L0009806.html>)—Educational site with multiple links related to constipation

Medlineplus Health Information (www.nlm.nih.gov/medlineplus/constipation.html)—Comprehensive, in depth information on constipation from the National Institute of Health

Association for Applied Psychophysiology and Biofeedback (www.aapb.org/)—Dedicated to research, clinical applications, and public information on biofeedback and related sciences

Conclusions

Notwithstanding some pessimistic views about the effects of biofeedback interventions for gastrointestinal conditions,⁶ biofeedback training seems to be a good treatment for lower gastrointestinal disturbances, especially for pelvic floor dyssynergia. The effects of such training may not be limited to the anorectum and might also be useful in other conditions in which pelvic floor dyssynergia plays a role.⁷

However, good quality research in this subject is lacking. Validated scoring systems and quantitative tests are still needed, as well as more uniform and strict criteria for pelvic floor dyssynergia.¹ For good quality studies, we also need improved experimental designs, larger numbers of participants, clearly defined outcome measures, knowledge of the best treatment protocol, and long term follow up.¹² Finally, it remains to be established whether other promising treatments for pelvic floor dyssynergia, whether used alone²⁵ or in combination with biofeedback,⁸ could provide better clinical outcomes.

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Competing interests: None declared.

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Corrections and clarifications

Use of automated external defibrillator by first responders in out of hospital cardiac arrest: prospective controlled trial

We inadvertently reversed two numbers in figure 1 of this paper by Anouk P van Alem and colleagues (*BMJ* 2003;327:1312-5). In the experimental group, 82 of the 157 participants in the "initial rhythm shockable" category were admitted to hospital. This represents 52% (not 25% as we stated).

Cognitive behaviour therapy affects brain activity differently from antidepressants

The news team has been a bit slow in adjusting to the new year. In this news article by Sue Mayor (10 January, p 69), the reported study was published in 2004 (not 2003, as we said). The correct reference is *Archives of General Psychiatry* 2004;61:34-41.

Career Focus

In the article "The way forward for non-standard grade (trust) doctors" by Rhona MacDonald (3 January, p s9), we were wrong to say that Professor Sam Lingam is the "former chairman of the British International Doctors Association"; he is in fact the current chairman of the association's Hospital Doctors' Forum. The association has asked us to point out to readers that the views expressed by Professor Lingam were not the views of the association.

Interactive case report

Treating nausea and vomiting during pregnancy

This case was described on 31 January and 7 February (*BMJ* 2004;276:337). Debate on the management of this case and the n of 1 trial continues on bmj.com (<http://bmj.com/cgi/content/full/328/7434/276>). On 7 March we will publish the

outcome of the case together with commentaries on the issues raised by the management and online discussion from a general practitioner, an obstetrician, a statistician, and an educationalist.