

Behavioural therapy (biofeedback) for solitary rectal ulcer syndrome improves symptoms and mucosal blood flow

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Gut 2004;53:368–370. doi: 10.1136/gut.2003.025643

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Accepted for publication
28 October 2003

Aims: The aim of the study was to determine if there is a permanent disorder of mucosal blood flow in patients with solitary rectal ulcer syndrome (SRUS) or a disorder related to autonomic gut innervation and physiological function that is reversible concomitant with successful treatment. Rectal mucosal blood flow was used as a validated measure of extrinsic autonomic nerve function.

Methods: Sixteen consecutive patients with SRUS (12 women; mean age 35 years) and 26 healthy controls (17 women; mean age 36 years) were studied. Laser Doppler mucosal flowmetry was performed before and after biofeedback treatment. Symptoms were documented before and after biofeedback treatment using a standardised prospectively applied questionnaire.

Results: Twelve of 16 patients (75%) reported subjective symptomatic improvement after treatment. Five of the 16 patients (31%) had sigmoidoscopic ulcer resolution. Pretreatment rectal mucosal blood flow was significantly lower in patients with SRUS compared with controls (163 (27) v 186 (14) flux units (FU) (mean (SD)); $p < 0.01$). Biofeedback resulted in a significant improvement in rectal mucosal blood flow in subjects who felt subjectively better after biofeedback ($p = 0.001$), from 165 (30) FU to 190 (40) FU.

Conclusion: Gut directed biofeedback is an effective behavioural treatment for the majority of patients with SRUS. Mucosal blood flow is reduced to a similar level seen in normal transit constipation, suggesting similar impaired extrinsic autonomic cholinergic nerve activity. Successful outcome following biofeedback is associated with increased rectal mucosal blood flow, suggesting that improved extrinsic innervation to the gut may be partially responsible for the response to treatment.

Solitary rectal ulcer syndrome (SRUS) is an uncommon¹ and often underdiagnosed² condition centred around a disorder of evacuation.³ Almost all patients strain excessively at stool and may visit the toilet several times a day for long periods in an attempt to evacuate,⁴ often with loss of only blood and mucus. Macroscopic evidence of ulceration is frequently, but not invariably, present.³

The condition is difficult to treat⁵ but current firstline therapy is biofeedback, employing a behavioural approach. In SRUS, this therapy has two aims: firstly, habit training to impose a discipline about the number of visits a patient makes to the toilet, time spent in the toilet, straining, digitation, and laxative use⁶; and secondly, to normalise pelvic floor coordination. The treatment therefore has a combination of psychological and physiological elements, and has been found to improve symptoms in over half of patients, but fails to render 75% of patients completely asymptomatic at a median follow up of nine months.⁷

We have previously shown that hindgut mucosal blood flow is reduced in patients with functional constipation,⁸ and that this blood flow can be increased with successful biofeedback treatment.⁹ Since rectal mucosal blood flow is a validated measure of extrinsic autonomic input to the gut,¹⁰ it has been suggested that biofeedback improves symptoms by altering efferent autonomic pathways to the gut.

The aim of this study was to establish the nature of rectal blood flow in patients with SRUS. Additionally, it was intended to study whether successful biofeedback therapy for SRUS would alter blood flow. Using this information, it should be possible to determine if there is a permanent disorder of mucosal blood flow or a disorder possibly related to autonomic gut innervation and physiological function that is reversible concomitant with successful treatment.

MATERIALS AND METHODS

Patients

Sixteen consecutive unselected patients with SRUS referred to a tertiary referral centre (12 women; mean age 35 years (range 19–57)) were studied. All patients reported symptoms of excessive straining at stool and passage of mucus and blood, and all had the characteristic endoscopic appearances of rectal mucosal ulceration. All patients were examined while straining and none was found to have an overt rectal prolapse. Symptoms were documented, before and after treatment, using a standardised prospectively applied questionnaire (table 1). Median duration of symptoms was six years (range 2–18). Biopsies for histology were taken in 14 patients to confirm the diagnosis.

Twenty six healthy volunteers (17 women; mean age 36 years (range 18–61)) with no gastrointestinal symptoms were studied as controls for the purpose of laser Doppler studies.

Laser Doppler studies of rectal mucosal blood flow

Laser Doppler mucosal flowmetry was performed in all SRUS patients before the start of biofeedback treatment and again after the last treatment by the same investigator who was blind to the patient's symptoms and treatment outcome.

Pre-menopausal female subjects were studied during the follicular phase of their cycles. Subjects were asked to fast for a minimum of four hours and not to smoke for one hour prior to investigation. They were studied in a room maintained at 22°C after 15 minutes of acclimatisation and were examined in the left lateral position. After digital examination and rigid sigmoidoscopy had confirmed that the rectum was empty,

Abbreviations: SRUS, solitary rectal ulcer syndrome; FU, flux units

Table 1 Questions asked when interviewing patients before and after biofeedback treatment

Question	Before	After
How often do you open your bowels? (per week/per day)		
How often do you try to open your bowels in a day but without any result?		
How long do you spend in the toilet on each visit when trying to open your bowels?		
During each visit to the toilet, for what proportion of the time do you strain? (%)		
Do you pass blood from your back passage?		
Do you pass mucus from your back passage?		
Do you put a finger into your back passage to help to empty stool?		
Do you put a finger into your vagina to help to empty stool?		
Do you ever have the feeling that you have not completely emptied your bowels?		
Do you ever experience any soiling or leaking from your back passage that you cannot control?		
Do you experience any abdominal bloating?		
Do you experience any pain around your back passage?		
Are you taking laxatives, suppositories or enemas? (If yes please list on the reverse of this sheet)		
Are you taking any other medication?		

the laser Doppler probe (DP6A; Moor Instruments, Axminster, UK) was introduced via the sigmoidoscope and recordings were made 2 cm proximal to the ulcer at four points circumferentially at 90° to each other. Readings were taken after the trace had stabilised for 30 seconds, as previously described.¹⁰ Results are presented as mean (SD).

Biofeedback treatment

All patients completed treatment with the same specialist nurse therapist (of which there were two involved in the study). Each patient was treated as an outpatient every four weeks for a median of five sessions (range 3–6). Each session lasted 30–60 minutes and patients were instructed in a variety of previously described techniques.^{6,7} They lay on a couch on their right side facing the therapist and the EMG display unit. A balloon was inserted into the rectum and inflated with 50 ml of air, giving the patient the sensation of a full rectum and thus the need to defecate. Two adherent surface electrodes were placed adjacent to the anal opening to assess external anal sphincter function. The patient watched the trace of muscle activity and could see the pattern of electrical activity at rest and during voluntary contraction. The patient was then asked to observe the trace while attempting to expel the balloon. If there was an obvious increase, rather than the normal decrease, in activity, the patient was encouraged to strain without increasing sphincter activity so that its appearance continued to resemble the resting trace.

Patients were also taught how to strain effectively by using a propulsive force through bracing with their abdominal muscles.

They were advised on normal defecatory behaviour and bowel habits. This included restricting the number of visits to the toilet for patients who made frequent defecatory attempts during the day, or increasing the number of visits to the toilet for those patients with infrequent defecation. The amount of time spent, and posture, in the toilet were also specified.

At each biofeedback session the therapist tried to achieve a good rapport with the patient to facilitate good understanding and collaboration. This included gaining an appreciation about the patient's personal life and psychological factors which may have been relevant.

An attempt was made to wean patients off laxatives, enemas, and suppositories. Sometimes this was achieved early in the course of therapy and sometimes progressively over a longer period. When the course of biofeedback therapy was complete, patients were encouraged to continue practising the techniques they had learnt.

Ethics approval

The study was given approval by the Harrow Research Ethics Committee and all patients gave informed consent.

Statistical analysis

Previous studies have shown laser Doppler flowmetric data to conform to a normal distribution.⁹ Recordings from before and after treatment in each group were assessed by means of a paired *t* test.

RESULTS

Immediately after the end of treatment, 12 of 16 patients (75%) reported a subjective overall improvement in their symptoms. Five of 16 patients (31%) had resolution of their ulcer, as seen on sigmoidoscopy.

Two of 16 patients were regular cigarette smokers and none was using non-steroidal anti-inflammatory drugs.

Laser Doppler studies of rectal mucosal blood flow

Baseline blood flow in the rectal mucosa was significantly lower in patients with SRUS compared with age and sex matched controls (162.6 (26.6) v 186.0 (13.7) flux units (FU) (mean (SD)); $p < 0.01$).

Biofeedback resulted in a significant improvement in rectal mucosal blood flow in the group as a whole and for those subjects who felt subjectively better after biofeedback. The increase in mean blood flow for all subjects was from 163 (27) FU to 183 (37) FU ($p = 0.001$) and for those subjects who gained improvement from 162 (21) FU to 193 (39) FU ($p = 0.001$). The mean increase in rectal blood flow for those subjects gaining no improvement was from 154 (15) FU to 163 (16) FU ($p = 0.338$).

A comparison of rectal mucosal blood flow for those patients who improved and those who did not improve post treatment, according to the structured questionnaire assessment, is shown in table 2.

DISCUSSION

This prospective study has confirmed the findings of previous studies that gut directed biofeedback is an effective behavioural treatment for the majority of patients with SRUS,^{6,7} with 75% of patients reporting subjective improvement. Thirty one per cent of those treated had macroscopic resolution of the rectal ulcer, which was not found to be the case in previous reports.^{6,7} With longer follow up it might be expected that further patients would heal their ulcer if the benefits from treatment were maintained. Longer follow up studies however have shown that improvement in symptoms of SRUS after biofeedback retraining deteriorates in some patients with time.⁶

It is known from previous studies that rectal mucosal blood flow, as measured by laser Doppler flowmetry, is reproducible, and the optimal study conditions defined in these studies have been followed.^{10,11}

We have shown that patients with SRUS have reduced resting mucosal blood flow. This reduction in resting mucosal blood flow has been found to reflect the level of activity of extrinsic autonomic innervation to the gut.⁸ The degree of reduction in blood flow seen in these patients with SRUS was similar to that seen in patients with normal transit constipation.⁸ In constipated patients, rectal mucosal blood flow is strongly correlated with parasympathetic cholinergic

Table 2 Post-treatment rectal mucosal blood flow stratified by response to assessment questions (number of patients)

	Unchanged or worse	Improved
Bowel frequency	157 (30) (n = 4)	193 (40) (n = 12)
Unsuccessful attempts at bowel opening	155 (27) (n = 5)	194 (42) (n = 11)
Time spent on toilet	159 (31) (n = 6)	187 (40) (n = 10)
Straining	153 (31) (n = 4)	192 (42) (n = 12)
Rectal blood loss	160 (31) (n = 6)	179 (39) (n = 10)
Rectal mucus loss	158 (30) (n = 6)	182 (37) (n = 10)
Need to digitate anally	160 (27) (n = 4)	187 (41) (n = 12)
Need to digitate vaginally	169 (23) (n = 10)	176 (45) (n = 6)
Sensation of incomplete emptying	160 (29) (n = 7)	181 (42) (n = 9)
Passive faecal soiling	168 (22) (n = 11)	168 (36) (n = 5)
Abdominal bloating	159 (32) (n = 6)	187 (39) (n = 10)
Perianal pain	152 (30) (n = 5)	190 (40) (n = 11)
Laxative/suppository use	161 (28) (n = 3)	189 (34) (n = 13)
Subjective overall improvement	162 (21) (n = 4)	193 (39) (n = 12)

Values are mean (SD) (number of patients).

dysfunction.¹² Successful outcome following biofeedback was associated with an increase in rectal mucosal blood flow back towards levels found in healthy control subjects. This autonomic alteration has been found to be gut specific in gut targeted biofeedback in the same way that specificity of response has been described for biofeedback applied to hypertension and tension headache.¹³⁻¹⁴ SRUS is a functional disorder specifically involving the gut, and the beneficial effect of biofeedback reinforces the gut specificity of this behavioural intervention.

There are several mechanisms by which behavioural treatment may alter gut function and blood flow. Autonomic innervation to the gut may be influenced through cerebral mechanisms, resulting in improved mucosal microcirculation and transit. Alternatively, it is possible that the observed increases in rectal mucosal blood flow are due to improvement in psychological or social functioning brought about by behavioural treatment. It has previously been shown that the level of activity of extrinsic autonomic innervation correlates with psychological parameters.¹² Lastly, the change in blood flow may reflect altered rectal motor function. This last possibility is the least likely as we have recently demonstrated that constipation corrected by biofeedback behavioural treatment is associated with improved mucosal blood flow whereas constipation corrected by laxatives is not.¹⁵

In conclusion, a reduced rectal mucosal blood flow suggests that patients with solitary rectal ulcer syndrome have impaired extrinsic autonomic cholinergic nerve activity. An increase in mucosal blood flow is associated with successful outcome after biofeedback treatment, suggesting improved activity of the direct autonomic efferent innervation to the gut.

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REFERENCES

- Martin CJ, Parks TG, Biggart JD. Solitary rectal ulcer syndrome in Northern Ireland. 1971-1980. *Br J Surg* 1981;**68**:744-7.
- Haray PN, Morris-Stiff GJ, Foster ME. Solitary rectal ulcer syndrome—an underdiagnosed condition. *Int J Colorectal Dis* 1997;**12**:313-15.
- Vaizey CJ, van den Bogaerde JB, Emmanuel AV, et al. Solitary rectal ulcer syndrome. *Br J Surg* 1998;**85**:1617-23.
- Nicholls RJ. Rectal prolapse and the solitary rectal ulcer syndrome. In: Kamm MA, Lennard-Jones JE, eds. *Constipation Petersfield*. UK: Wrightson Biomedical Publishing Ltd, 1994.
- Lam TC, Lubowski DZ, King DW. Solitary rectal ulcer syndrome. *Baillieres Clin Gastroenterol* 1992;**6**:129-43.
- Malouf AJ, Vaizey CJ, Kamm MA. Results of behavioral treatment (biofeedback) for solitary rectal ulcer syndrome. *Dis Colon Rectum* 2001;**44**:72-6.
- Vaizey CJ, Roy AJ, Kamm MA. Prospective evaluation of the treatment of solitary rectal ulcer syndrome with biofeedback. *Gut* 1997;**41**:817-20.
- Emmanuel AV, Kamm MA. Laser doppler flowmetry as a measure of extrinsic colonic innervation in functional bowel disease. *Gut* 2001;**46**:212-17.
- Emmanuel AV, Kamm MA. Response to a behavioural treatment, biofeedback, in constipated patients is associated with improved gut transit and autonomic innervation. *Gut* 2001;**49**:214-19.
- Emmanuel AV, Kamm MA. Laser doppler measurement of rectal mucosal blood flow. *Gut* 1999;**45**:64-9.
- Emmanuel AV, Kamm MA, Beard RW. Reproducible assessment of vaginal and rectal mucosal and skin blood flow: laser doppler fluximetry of the pelvic microcirculation. *Clin Sci (Lond)* 2000;**98**:201-7.
- Emmanuel AV, Mason HJ, Kamm MA. Relationship between psychological state and level of activity of extrinsic gut innervation in patients with a functional gut disorder. *Gut* 2001;**49**:209-13.
- Schwartz GE. Biofeedback, self-regulation, and the patterning of physiological processes. *Am Sci* 1975;**63**:314-24.
- Tarler-Benlolo L. The role of relaxation in biofeedback training: a critical review of the literature. *Psychol Bull* 1978;**85**:727-55.
- Murray CDR, Emmanuel AV, Kamm MA. Biofeedback, not laxatives, improves symptoms, transit and autonomic tone in functional constipation. *Gut* 2003;**52**(suppl 1):A15.