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

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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 that improved extrinsic innervation to the gut may be partially responsible for the response to treatment.

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

The condition is difficult to treat 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 use; 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.

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

Premenopausal 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
Biofeedback for SRUS improves symptoms and mucosal blood flow

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 continue practicing 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. 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 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, 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. 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.

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.

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. The degree of reduction in blood flow seen in these patients with SRUS was similar to that seen in patients with normal transit constipation. In constipated patients, rectal mucosal blood flow is strongly correlated with parasympathetic cholinergic...
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.\textsuperscript{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.\textsuperscript{15} 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.\textsuperscript{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 a successful outcome after biofeedback treatment, suggesting improved activity of the direct autonomic efferent innervation to the gut.

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

<table>
<thead>
<tr>
<th>Question</th>
<th>Unchanged or worse</th>
<th>Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowel frequency</td>
<td>167 (30) [n = 4]</td>
<td>193 (40) [n = 12]</td>
</tr>
<tr>
<td>Unsuccessful attempts at bowel opening</td>
<td>155 (27) [n = 5]</td>
<td>194 (42) [n = 11]</td>
</tr>
<tr>
<td>Time spent on toilet</td>
<td>159 (31) [n = 6]</td>
<td>187 (40) [n = 10]</td>
</tr>
<tr>
<td>Straining</td>
<td>153 (31) [n = 4]</td>
<td>192 (42) [n = 12]</td>
</tr>
<tr>
<td>Rectal blood loss</td>
<td>160 (31) [n = 6]</td>
<td>179 (39) [n = 10]</td>
</tr>
<tr>
<td>Rectal mucus loss</td>
<td>158 (30) [n = 6]</td>
<td>182 (37) [n = 10]</td>
</tr>
<tr>
<td>Need to digitate anally</td>
<td>160 (27) [n = 4]</td>
<td>187 (41) [n = 12]</td>
</tr>
<tr>
<td>Need to digitate vaginally</td>
<td>169 (23) [n = 10]</td>
<td>176 (45) [n = 6]</td>
</tr>
<tr>
<td>Sensation of incomplete emptying</td>
<td>160 (29) [n = 7]</td>
<td>181 (42) [n = 9]</td>
</tr>
<tr>
<td>Passive faecal soiling</td>
<td>168 (22) [n = 11]</td>
<td>168 (36) [n = 5]</td>
</tr>
<tr>
<td>Abdominal bloating</td>
<td>159 (32) [n = 6]</td>
<td>187 (39) [n = 10]</td>
</tr>
<tr>
<td>Perianal pain</td>
<td>152 (30) [n = 5]</td>
<td>190 (40) [n = 11]</td>
</tr>
<tr>
<td>Laxative/suppository use</td>
<td>161 (28) [n = 3]</td>
<td>189 (34) [n = 13]</td>
</tr>
<tr>
<td>Subjective overall improvement</td>
<td>162 (21) [n = 4]</td>
<td>193 (39) [n = 12]</td>
</tr>
</tbody>
</table>

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

### References