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An analysis of rectal morphology in obstructed defaecation

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Abstract. Obstructed defaecation in the descending perineum syndrome has been attributed to anterior mucosal prolapse. Manometric and radiological measurements together with evacuation proctograms in 49 patients with obstructed defaecation and normal whole gut transit times were carried out and compared in a total of 25 controls. Proctography delineated four groups: (I) puborectalis accentuation, $n=11$; (II) rectal intussusception, $n=25$; (III) anterior rectal wall prolapse, $n=11$; (IV) rectocele, $n=2$. The anorectal angle at rest, maximum basal sphincter pressures and the rectoanal inhibitory reflex did not differ between the groups and controls. Group III achieved a greater increase in anorectal angle on straining than controls. Groups II and III exhibited significant perineal descent below the pubococcygeal line whereas group I did not. In perineal descent intussusception was the commonest morphological abnormality associated with obstructed defaecation. Isolated anterior mucosal prolapse was not observed, making local treatment aimed at reducing its bulk questionable.

The symptoms of obstructed defaecation in the descending perineum syndrome (DPS) have been attributed to prolapsing redundant anterior rectal mucosa occluding the anal canal [1]. This is said to lead to the sensation of a faecal bolus resulting in strenuous efforts to evacuate the mucosal fold. These cycles of straining, mucous and bloody discharge and associated aching in the pelvis make up the classic presentation of this syndrome. An almost identical pattern of symptoms is observed in patients with the solitary rectal ulcer syndrome [2, 3] and in rectal intussusception or internal procidentia [4–7]. The recommended treatment in DPS is to reduce the bulk of the redundant mucosa by injection of sclerosants, banding or the operations of extended haemorrhoidectomy or anterior mucosal strip [1]. The results of such therapy are unpredictable [8] and many patients continue to have severe obstructive symptoms. Failure of local measures in rectal intussusception is explicable since the full thickness of the rectal wall obstructs the passage of the faecal bolus.

In this study we carried out manometric and radiological tests to elucidate the mechanics of the disordered rectal emptying in a consecutive series of patients with normal whole gut transit [9].

Patients and methods

Measurements were made in 49 patients (38 F, 11 M) median age 56, range 25–74, with long-standing obstructed defaecation in whom dietary manipulation had failed to alleviate their symptoms. All patients had undergone full clinical investigation including sigmoidoscopy and barium enema examination. For comparison, studies were also carried out in a total of 25 control subjects (18 women and 7 men; median age 55, range 20–78). The latter comprised normal volunteers or patients awaiting minor surgery for conditions not related in any way to the gastro intestinal-tract.

Ethical conditions

Informed consent was obtained from each subject. The study was approved by the Ethical Committee of the Bristol and Weston Health District.

Design of the study

A detailed history using a standard questionnaire was obtained from each patient, noting the presence or absence of

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specific symptoms related to defaecation and a previous history of factors which could damage the pelvic floor. A full clinical examination was performed on each patient. This included inspection and digital examination of the anorectum, proctoscopy and sigmoidoscopy.

Radiological and manometric measurements were carried out on two separate days. The transit studies were performed before entry into the study. No bowel preparation was used before each investigation.

Methods

Anorectal manometry. Intraluminal pressure in the anal canal was measured using a precalibrated water filled closed system consisting of a detecting probe 4 mm diameter attached by a non-distensible polyethylene tube to a transducer (Statham 230B, Oxnard, California, USA) connected via an amplifier (Hewlett Packard 7888A, Waltham, Massachusetts, USA) to an 8 channel recorder (Hewlett Packard, Waltham, Massachusetts, USA). Before each study the system was calibrated for pressures between 0 and 200 cm water. With the patient in the left lateral position the probe was inserted into the rectum. The probe was then withdrawn in 1.0 cm increments. At each station maximum basal anal sphincter pressure was recorded. Sphincter length was assessed by the length of the high pressure zone [10]. This sequence was then repeated at each station whilst the subjects maximally contracted their sphincter, and the maximum squeeze pressure was recorded.

Recto-anal inhibitory reflex. Rectal distension induces reflex inhibition of anal tone [11]. To elicit this recto-anal inhibitory reflex, a probe similar to that described above was positioned so that the maximum basal pressure was recorded. A balloon was inserted into the upper rectum and inflated with air in increments of 10 ml for periods of 60 seconds. This caused a reduction in sphincter tone, which initially recovered to its original value while the balloon remained inflated. Eventually a volume was reached at which the sphincter pressure failed to recover during the minute the balloon remained inflated. The lowest volume to inhibit recovery of internal sphincter tone for one minute was recorded [12].

Bowel transit study. Three sachets of Fybogel (Reckitt and Coleman, Pharmaceutical Division, Hull) were taken daily (10 g fibre/day) for 2 weeks. The subjects were then given 20 radio-opaque markers [9]. Plain abdominal radiographs were taken at 48 hours and 5 days following ingestion. The number of markers remaining in the colon at 5 days were counted. Eighty per cent of the markers should be passed by 5 days [9].

Standard proctography

Anorectal angle

The anorectal angle was measured radiologically. The patient lay on an X-ray couch on the left side with hips flexed to approximately 90° to the trunk. Fifty millilitres of a 50 per cent solution of radio-opaque barium sulphate were injected into the rectum through a narrow catheter. A plastic ball, 2 cm in diameter, attached to a beaded metal chain, was then inserted so that the ball lay in the rectal ampulla and the chain in the anal canal. In this way, the axis of the rectum was outlined by the barium and the axis of the anal canal was indicated by the chain. A metal marker was placed on the perineal skin just behind the anal margin. Lateral radiographs were taken with the subject at rest and while straining as at stool [13].

The level of the anorectal angle

On each of the radiographs, a line (the pubococcygeal line) was drawn from the tip of the coccyx to the most anterior point on the symphysis pubis. A perpendicular was then dropped from this line to the apex of the angle formed by the axis of the rectum and the axis of the anus. When the distance from the pubococcygeal line to the anorectal angle was above the pubococcygeal line, a positive measurement was recorded, while if the angle lay below the line a negative measurement was recorded [13].

Evacuation proctography

No bowel preparation was used since it was deemed more physiological to observe ano-rectal morphology without prior preparation. Fifty millilitres of dilute barium sulphate were introduced into the rectum. The subject was then seated on a specially designed perspex water filled commode. This is important to obtain good quality radiographs as conventional commodes result in suboptimal radiographs when using an automatic exposure system (Iontomat). X-ray films were taken by ampliphotography using a 100 mm camera (Sircam 106, Siemens) 0.6 mm focus and a voltage of 125 KV from a 1,000 mA generator to give a short exposure at a rate of 1 frame/s. Each frame was numbered automatically enabling the sequence to be analysed in detail [7].

Results

Evacuation proctography

In nine normal control subjects without colorectal symptoms rectal emptying occurred with relaxation of the anorectal angle which became obtuse. The anorectum became funnel shaped with short-

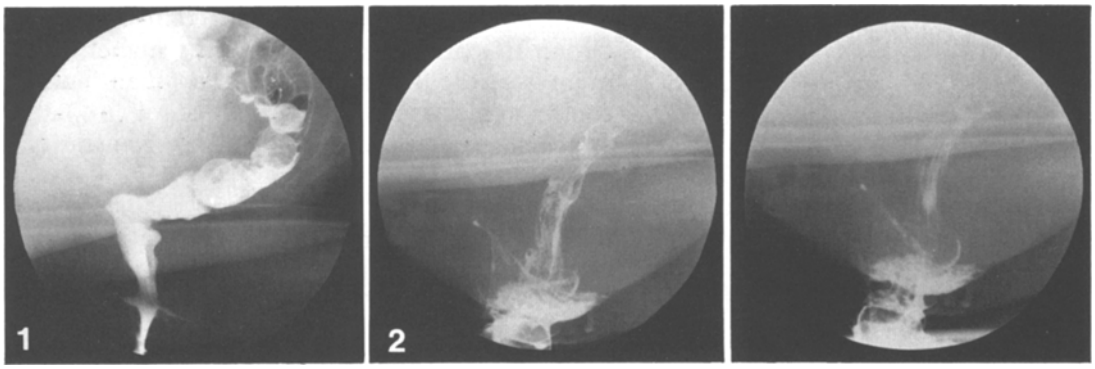

Fig. 1. Lateral projection of the anorectum with the patient seated on radiolucent commode during attempted defaecation. The anorectal angle remains approximately 90° with a persistent impression from the puborectalis

Fig. 2. Lateral projections of the anorectum showing a recto-anal intussusception. The narrow proximal rectum is prolapsing into the funnel shaped distal rectal ampulla

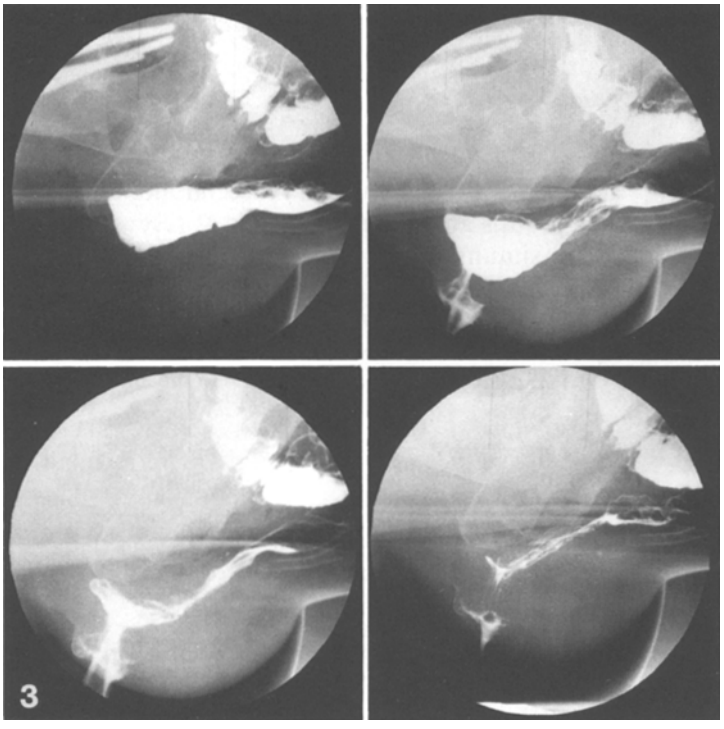

Fig. 3. Sequential radiographs during rectal evacuation showing a small rectocele and prolapse of the anterior/superior rectal wall. The changes are most marked in the bottom left frame

ening of the anal canal and evacuation of the contrast material. Eleven subjects failed to relax the anorectal angle significantly and moreover produced an accentuation of the puborectalis impression (Fig. 1). A total of 25 patients produced a rectal intussusception, either recto-rectal or recto-anal in character (Fig. 2). In 11, the anterior rectal wall was observed to prolapse downwards into the anal canal as a full thickness of the whole rectal wall (Fig. 3). Finally two patients demonstrated a small rectocele with no other morphological abnormality. Isolated anterior rectal mucosal prolapse was not observed.

The patients were divided into the three larger groups, the fourth being too small for statistical comparison. Patients with puborectal accentuation were included in Group I, those with rectal intussusception in Group II and those with anterior rectal wall prolapse in Group III.

Clinical (see Table 1)

There was no significant difference between the three patient groups with respect to age, length of history, stool frequency, rectal bleeding and the incidence of previous hysterectomy. None of the Group 3 patients had sustained an obstetric tear.

Manometry (see Table 2)

Sphincter pressures. There was no significant difference in the basal sphincter tone between any of

Table 1. Clinical details of patients[a]

	Group I Pubo-rectalis accentu-ation	Group II Rectal Intussus-ception	Group III Anterior rectal wall prolapse
No. of patients	11	25	11
Length of history (years) median (range)	7.5 (1–20)	7.5 (1–40)	19 (1–20)
Bowel frequency No. of stools per week	10 (1–21)	7 (1–35)	7 (2–28)
Normal call to stool	82%	82%	100%
Obstructed defaecation	100%	100%	100%
Rectal bleeding	73%	77%	45%
Hysterectomy[b]	25%	43%	43%
Perineal tear[b]	25%	24%	0

[a] 2 patients with rectoceles not included in analysis
[b] Percentages apply to female patients only

the patient groups and normal control subjects. Group III patients had significantly higher maximum squeeze sphincter pressures than normal control subjects ($p < 0.01$) and Group 1 ($p < 0.02$). The first two groups did not differ from normal controls.

Recto-anal inhibitory reflex. All patients and controls inhibited sphincter tone normally following rectal distension. There was no difference in the volume of air in a rectal balloon to reduce sphincter pressures by > 20 cm water for one minute between the groups and normal controls.

Radiology

Anorectal angle. There was no significant difference in the size of the anorectal angle between the groups and normal controls at rest and during a maximum sphincter contraction. On straining down only Group III produced angles which were significantly more obtuse than normal controls ($p < 0.004$). They were also more obtuse than Group 2 ($p < 0.016$) and Group 1 ($p < 0.0005$). The

Table 2. Manometric and radiological measurements from the patient groups and normal controls compared using Kruskal-Wallis analysis of variance and Mann-Whitney U test

		Controls	Group I	Group II	Group III
Number of patients		25	11	25	11
Age (years)		55 (20–78)	43 (25–62)	55 (28–74)	58 (28–73)
Manometry					
Maximum resting sphincter pressure (cm water)		85 (60–115)	75 (40–160)	105 (30–160)	112.5 (60–135)
Maximum squeeze sphincter pressure (cm water)		210 (110–290)	190 (70–675)	180 (55–350)	276 (140–435)[a]
Recto-anal inhibitory reflex (ml)		40 (10–140)	60 (20–90)	70 (20–180)	65 (30–160)
Radiology					
Anorectal angle (degrees)	Rest	92.5 (78–102)	91.0 (83–106)	88.5 (70–119)	95.0 (70–110)
	Squeeze	86.0 (70–110)	83.0 (71–107)	84.0 (66–113)	86.0 (60–100)
	Strain	111.0 (80–130)	91.0 (78–122)	114.0 (85–138)	134.5 (104–142[a 1]
Level of anorectal angle below pubococcygeal line (cm)	Rest	0.0 (+1.0 to −1.1)	0.0 (+1.5 to −1.0)	−1.0 (+1.1 to −4.3)	−0.5 (+0.8 to −2.1)
	Squeeze	1.0 (+2.2 to −1.1)	0.0 (+1.2 to −0.7)[a]	−0.4 (+1.0 to −4.1)[a 1]	0.0 (+1.2 to −2.1)[a]
	Strain	−1.7 (−0.9 to −4.3)	−3.5 (−0.3 to −7.0)	−5.6 (−1.2 to −11)[a 1]	−4.8 (−2.8 to −8.0)[a 1]

Results expressed as median (range)
Statistical significance: Kruskal-Wallis analysis of variance and Mann-Whitney U test
[a] Significant difference from controls $P < 0.05$. Superscript [1] denotes $P < 0.005$

normal controls and Groups II and III significantly increased the anorectal angle on straining ($p < 0.05$; Wilcoxon signed rank sum test for paired data). In contrast, patients in Group I failed to increase significantly the anorectal angle ($p > 0.05$) (Fig. 1).

Level of anorectal angle. At rest the level of the anorectal angle in relation to the pubococcygeal line did not differ between the groups and normal controls. During a maximum squeeze all three groups failed significantly to elevate the pelvic floor compared to controls. The largest difference was between Group II ($p < 0.001$) and the smallest between Group I ($p < 0.04$) with Group III in between ($p < 0.01$). Groups I and II also differed significantly ($p < 0.04$).

On straining down there was significant perineal descent compared with controls in Group II ($p < 0.00001$) and Group III ($p < 0.0004$) but not in Group I ($p < 0.21$).

Discussion

Defaecatory difficulties may be a source of great distress to the patient. Many have resorted to severe straining over a number of years. Some use a variety of manoeuvres to achieve rectal emptying including digital evacuation of faeces. Frequently they are too embarrassed to admit to such habits and need sympathetic handling. The symptoms of tenesmus and associated rectal bleeding or the passage of mucus might suggest a rectal carcinoma, yet standard investigations including barium enema will not give a positive diagnosis. Sigmoidoscopy may result in the mistaken diagnosis of non specific proctitis where the changes of the mucosal prolapse syndrome [14] or solitary rectal ulcer syndrome may be confused. Local steroids and sulphasalazine have not been shown to help [3]. Unless the patient is examined during a straining manoeuvre the characteristic signs will be missed. The perineum should be observed and inspected digitally. The unfolding of the rectal wall is readily palpable as is the descent of the anterior rectal wall. Once these physical signs have been detected then evacuation proctography is indicated. It should be possible in most radiological departments with an image intensifier. Having ascertained the cause of the obstructive symptoms, appropriate therapy can be planned.

In this study we selected 49 patients with normal whole gut transit who all had long standing severe obstructed defaecation. Simple proctoscopy in all patients suggested a redundant anterior rectal mucosa which prolapsed into the examining instrument as in the classical description of Parks et al. [1]. Evacuation proctography did not reveal this as an isolated phenomenon in any of the patients investigated. In all the cases in Groups II and III prolapse of either the full thickness of the rectal circumference (internal procidentia) or of the anterior rectal wall occurred. Further attempts to evacuate contrast were impeded by this obstructing prolapse. In some subjects contrast and faeces were expelled and the rectal intussusception was associated with a feeling of incomplete emptying.

In Group I patients failure of rectal emptying was associated with accentuation of the puborectalis impression suggesting failure to relax the pelvic floor with paradoxical contraction of the musculature [15]. This might indicate a behavioural disorder with lack of co-ordinated relaxation during defaecation and reversal of the normal pattern. When static measurements were made two patients appeared able to increase the anorectal angle. However, this manoeuvre was carried out in the left lateral position with the patient bearing down. Patients having evacuation proctograms were in the seated position during actual rectal emptying, and thus the observations were considered more physiological. Efforts were made to reduce patient embarrassment and therefore to aid pelvic floor relaxation by careful explanation, reducing the number of people present and darkening the X-ray room. Despite these measures we cannot exclude failure of puborectalis relaxation due to self consciousness on the part of the patient.

From the data presented we were able to determine the probable cause of the obstructive symptoms in all but two of the patients. It is possible that those classified as Group I with puborectalis accentuation may in time progress to the morphological changes seen in Groups II or III, but proper longitudinal studies will be required. Other workers have reported paradoxical puborectalis contraction in the solitary rectal ulcer syndrome [16], descending perineum syndrome and in rectal intussusception [17]. They suggest that patients are attempting to defaecate against a contracting pelvic floor. Kuijpers et al. [18–20] describe such patients with inappropriate puborectalis accentuation as suffering from the spastic pelvic floor syndrome. They considered that slow transit constipation in half of their patients was secondary to defective rectal emptying.

This study has demonstrated that simple evacuation proctography will help to elucidate the cause of symptoms in obstructed defaecation. Our failure to demonstrate isolated mucosal prolapse explains why local measures aimed at excising such prolapse or reducing its bulk do not work, since the abnormality lies in the colonic wall rather than the mucosa. Patients with defaecatory disorders present a therapeutic challenge. Progress in the management can only be made by understanding the pathophysiology. Proctography provides an objective assessment of anorectal morphology in obstructed defaecation.

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