Role of Proctography in Severe Constipation

A. INFANTINO, M.D., A. MASIN, M.D., P. PIANON, M.D., G. DODI, M.D., G. DEL FAVERO, M.D.,* F. POMERRI, M.D.,† M. LISE, M.D.

Infantino A, Masin A, Pianon P, Dodi G, Del Favero G, Pomerri F, Lise M. Role of proctography in severe constipation. Dis Colon Rectum 1990;33:707-712.

As referred to in the literature, patients complaining of constipation may have a spastic or, in the case of chronic straining, weak pelvic floor. Twenty-two severely constipated patients who did not improve after a high fiber diet were submitted to whole gut transit time (TT), proctographic, and anorectal manometric studies. A control group consisting of five subjects for TT, five subjects for proctogram, and ten subjects for manometry was also studied. Transit time was delayed ($P < 0.001$) in all patients. Manometry in the constipated group showed a high rectal threshold (64.1 *vs.* 17.1 ml of air, $P < 0.01$), but no other significant difference. Proctograms in 10 of 22 patients (Group A) showed no differences in the anorectal angle (ARA) and in its distance from the pubococcygeal line (DLPC) in respect to the control group; 12 of 22 patients (Group B) had a paradoxical closure of the ARA at straining in respect to resting position (101.2° *vs.* 120.1°), and a higher DLPC than Group A and the control group in all positions studied. There was no difference in TT for rectal stasis of radiopaque markers between the two pathologic groups. Patients in Group B were older than patients in Group A (55.3 *vs.* 42.9 years, $P < 0.05$). In conclusion, proctograms showed alterations of the pelvic floor, but there was no correlation between proctographic data and rectal or colonic stasis of the radiopaque markers, or clinic severity of constipation, but a correlation between ages did exist. [Key words: Constipation; Anorectal Manometry; Proctogram; Rectum; Anorectal angle]

From the Department of Surgery I,
**Division of Gastroenterology,*
†Department of Radiology I,
University of Padova, Italy

Address correspondence to Dr. Infantino: Degli Studi Di Padova, Istituto Di Patologia Chiurugica I, Policlinico, Via Giustiniani, 2 - 35100 Padova, Italy.

CONSTIPATION IS A common disease that affects many people. Radiographs show weak pelvic floor muscles[1] often associated with nerve damage due to chronic straining.[2] Others report pelvic muscle spasm in constipated patients.[3]

Twenty-two patients (2 men and 20 women; mean age, 48.1 years; range, 17 to 84 years), complaining of severe constipation—*i.e.*, two or less bowel movements per week, resistant to high fiber diet—were studied to correlate the severity of proctogram data to clinical and manometric results.

Methods

Each patient underwent perineal and digital examination and rigid rectosigmoidoscopy after accurate history.

Total gut transit time (TT), anorectal manometry, and proctogram were performed only in patients who did not improve after at least one month on a high fiber diet (40 grams of crude fiber per day).

Transit Time: Plain radiographs of the abdomen were taken five days after ingestion of 30 radiopaque pills. Transit time was considered normal if at least 80 percent of the markers were expelled. A control group of five control subjects (4 men and 1 woman; mean age, 30.6 years), underwent the same procedure.

Manometry: Anorectal pressure was measured in all constipated patients and in 10 control subjects (4 men and 6 women; mean age, 33 years). A water-filled balloon connected to an electromechanical transducer (Statham P21) and to an OTE-BIOMEDICA recorder.

The following parameters were evaluated: maximum anal pressure at rest; anal canal length at rest; rectal threshold at inflation of a standard 10-cm balloon in increments of 10 ml of air; volumes required to evoke continuous rectal sensation of evacuation; and rectoanal inhibitory reflex of 1 m'.

A standard 10-cm balloon was inflated with air and deflated one minute later; this process was repeated each time with an increase of 10 ml of air to reinflate the balloon. A microballoon situated at the point of maximum pressure of the anal canal was used to measure internal sphincter tone. This technique allowed recording of rectal threshold, continuous rectal sensation, initial and complete (1 minute) rectoanal inhibitory reflex, and rectal compliance after progressive inflation of a 10-cm rectal balloon by air in increments of 50 ml. Rectal pressure was measured by detracting the pressure of the same balloon previously inflated with the same progression in air.

Proctogram: All patients underwent proctographic examinations. After a transanal injection of high density barium (100 percent) in a standard quantity (50 ml), a radiotransparent ball was introduced into the anus to mark the internal anal canal; a little chain held the ball in that position by gentle traction. The patients were seated on a chair for this procedure. The distances between the anorectal angle (ARA) and the pubococcygeal line (DPCL) at rest, during straining, and contraction were calculated. A control group (4 men and 1 woman; mean age, 35 years) with no coloproctologic disease underwent the same procedure.

Statistical Analysis: The Mann-Whitney U test was used to assess statistical significance.

Results

All patients complained of constipation for a long period: 2 to 40 years. One patient recalled that constipation had started immediately after undergoing a total hysterectomy ten years before. None of the other patients could relate constipation to any specific cause.

Seven patients had hard feces, six had moderately hard feces, and five patients reported loose feces only because of a high dosage of laxatives; four patients reported feces of normal consistency. All but five patients had to strain excessively to pass feces. Nineteen patients reported a sensation of incomplete defecation. Defecation improved in two women during the menstrual cycle, but no other women reported changes during their cycle. Laxatives were consumed daily by 80 percent of the patients and periodically by 20 percent.

At physical examination, 7 of 22 patients showed perineal descent while straining, and five patients had rectoceles.

At proctoscopic examination, four patients had first-degree hemorrhoids, 11 had occult rectal mucosal prolapse, 1 had anal fissure, and 1 had melanosis coli.

Transit time was significantly delayed ($P < 0.001$) in all constipated patients; in fact, we found more than 70 percent of radiopaque markers in the large bowel in patients on the fifth day after injection but only 5 percent in the control group.

Proctogram: Table 1 shows that the ARA was similar in both constipated and control groups, and the distance between the ARA and pubococcygeal line did not increase significantly in constipated patients (Table 2).

Due to ARA variations in the resting and straining positions, we divided the constipated patients into two groups: Group A (2 men, 8 women) and Group B (12 women). In Group A the ARA was more obtuse at straining than at rest, but in Group B the ARA at straining decreased in respect to the ARA at rest (Figs. 1-3).

TABLE 1. *Anorectal Angle Degree at Proctography*

		C	R	S
Controls	X	104.6	118.4	120.0
	DS±	21.6	11.4	13.0
Patients	X	102.6	117.6	110.8
	DS±	13.2	15.0	19.7

R: at rest; C: contraction; S: straining.

TABLE 2. *Proctographic Distance of the Anorectal Angle from the Pubococcygeal Line (mm)*

		C	R	S
Controls	X	2.4	18.4	45.4
	DS±	7.5	17.0	22.9
Patients	X	19.7	30.2	50.4
	DS±	16.0	17.6	25.6

R: at rest; C: contraction; S: straining.

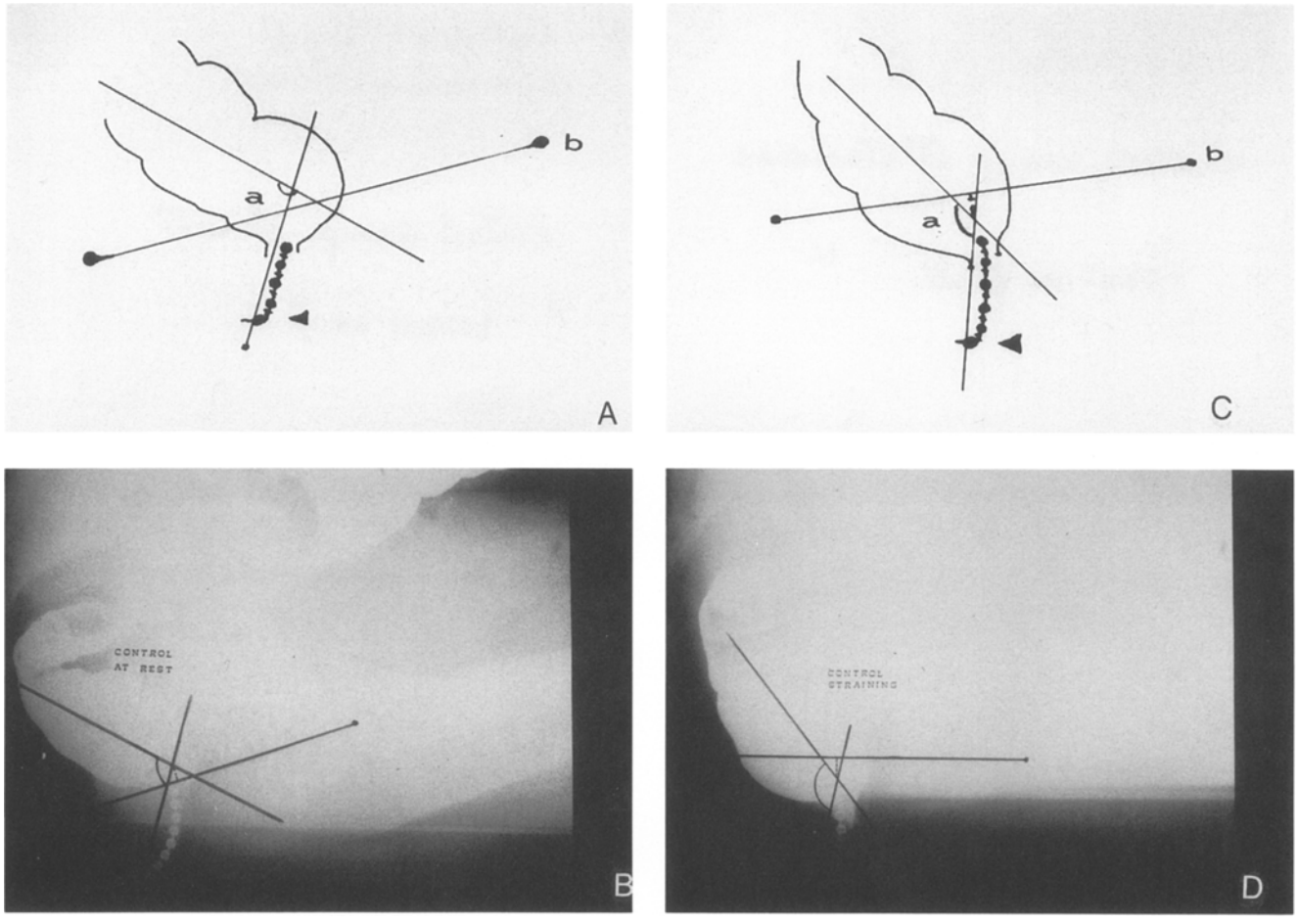


FIG. 1. Proctogram of the control group shows the anorectal angle (a) and its distance from the pubococcygeal line (b) at rest (1A and B) and during straining (1C and D).

Ages between the two groups were significantly different: Group A, 42.9 years (range, 17 to 79 years) *vs.* Group B, 55.3 years (range, 21 to 84 years) ($P < 0.05$).

No difference was found on physical examination: perineal descent, 2 patients in Group A and 5 patients in Group B; hemorrhoids, 1 patient in Group A, 3 patients in Group B; rectal occult mucosal prolapse, 4 patients in Group A and 7 patients in Group B.

Transit Time: No difference was observed between rectal or colonic stasis in the two groups; only 4 patients had rectal stasis on the fifth day—2 in each group.

Manometry: Manometry showed almost the same difference in rectal threshold when Groups A and B were compared with the control group: $P < 0.01$ and $P < 0.02$, respectively. No other significant difference was found between the two groups or in respect to the controls (Tables 3 and 4).

Proctogram: Table 5 shows the difference in the ARA at rest, in contraction, and at straining in Groups A, B, and in the control subjects. At straining, the ARA in Group B was significantly reduced in comparison to Group A ($P < 0.01$) and to the control group ($P < 0.05$).

Statistical differences were not observed in the ARA in contracting position in either of the constipated groups.

In Group B, the ARA at rest was more obtuse than in the control subjects ($P < 0.02$), but at straining it was less obtuse than that of both the control group ($P < 0.05$) and Group A ($P < 0.02$).

The distance between the ARA and pubococcygeal line (Table 6) was much higher in Group B than in the control group at rest ($P < 0.05$) and during contraction ($P < 0.05$).

The difference between DLPC in Groups A and B was statistically significant in all positions studied.

We found a higher rate of radiologic rectoceles in Group A than in Group B at straining: 5 of 8 (60 percent) *vs.* 4 of 12 (33 percent); this rate was higher than that found during physical examination (1 of 8 in Group A; 4 of 12 in Group B).

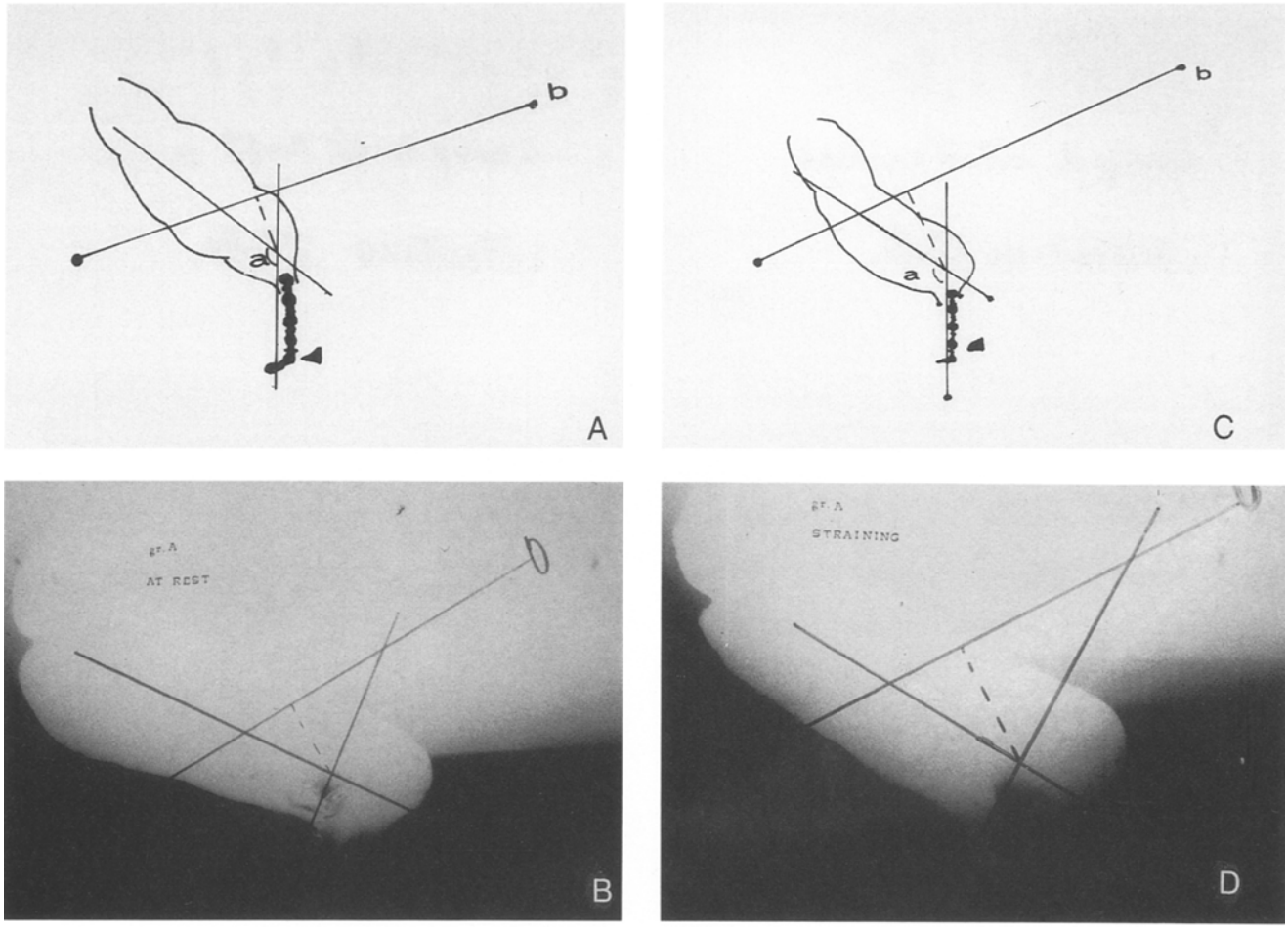


FIG. 2. Proctogram of Group A shows an increase in the distance between the anorectal angle (a) and the pubococcygeal line (b) at rest (2A and B) and at straining (2C and D), in respect to the control group.

Discussion

Previous literature has demonstrated manometric alterations of the rectoanal complex in patients complaining of constipation; Meunieur *et al.*[4] found a high sphincter pressure in half of the constipated children that were studied. Similar results are described by Read *et al.*[5] in a well-selected group of constipated young women. High pressure may be due to the hypertonic internal sphincter; however, it is difficult to believe that this hypertonia causes difficult defecation because it may only be an expression of a generalized increased colonic tone.[4]

In our study, anal canal pressure of patients at rest did not differ from that of the control subjects. Only the rectal threshold was significantly higher in our group of constipated patients than in the control group. This is not related to rectal capacity, because rectal compliance and the volume necessary for painful distention of the rectum were similar in both constipated and control groups. The desire to defecate is related to rectal sensation, so we believe that our patients must have large amounts of feces to feel the need to defecate. Rectal hyposensitivity without alterations of anal-canal pressure was demonstrated by Baldi *et al.*[6]

Proctograms showed that 12 of 22 patients had paradoxical closure of the ARA at straining in respect to resting position. None of the subjects in the control group had a similar condition.

The commonest hypothesis is that there is a contraction of striated anal sphincter at straining[1,3,7,8]; Shouler and Keighley demonstrated increased activity of the puborectalis muscle during straining using electromyography.[9]

We did not perform electromyography on these patients, but we did, however, expect a decrease in DLPC due to paradoxical contraction of the puborectalis muscles in Group B. However, DLPC never decreased, therefore, we believe there was no contraction. Recently it has been hypothesized that patients are unable to

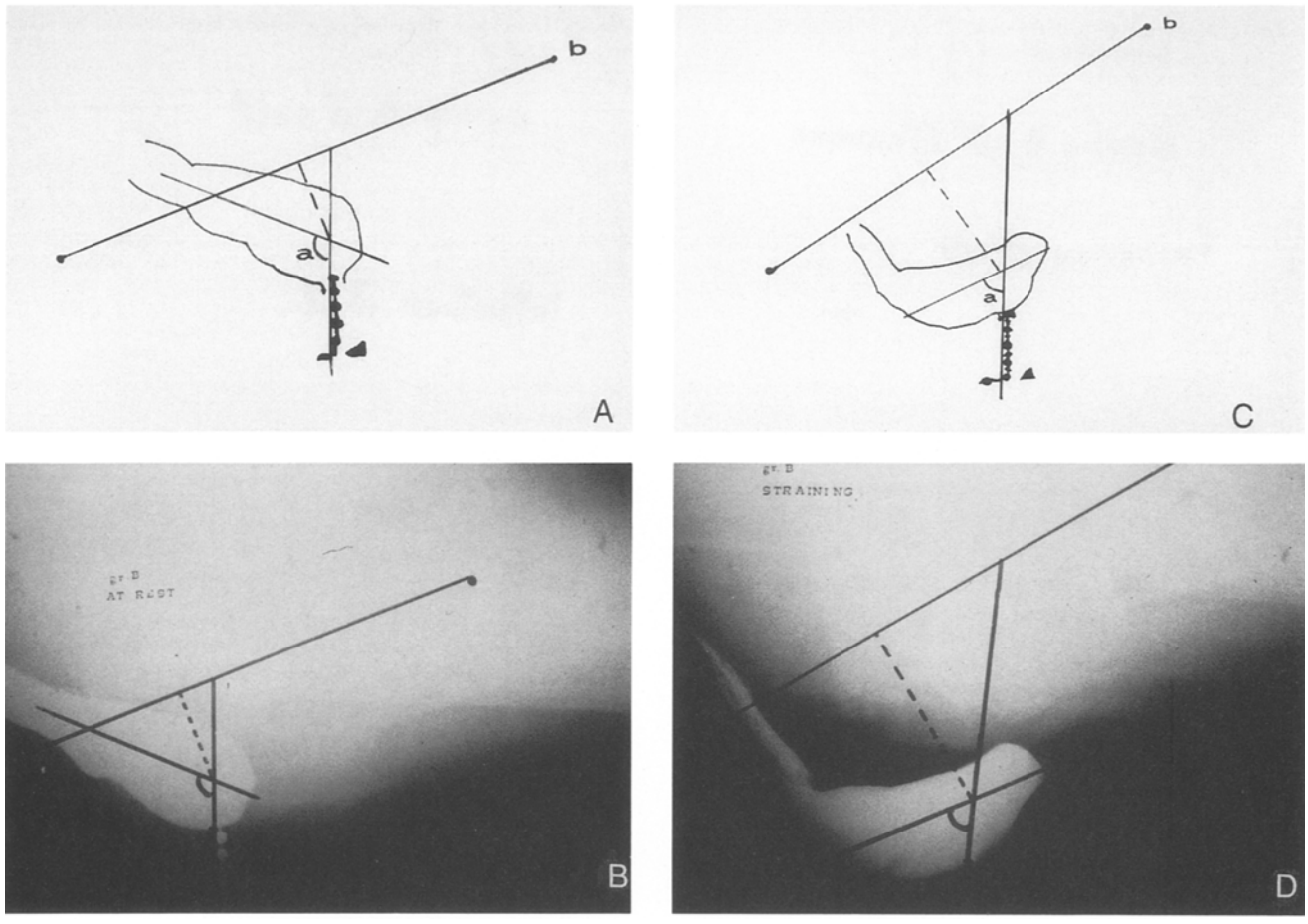


FIG. 3. Proctogram of Group B shows an increase in the distance between the anorectal angle (a) and pubococcygeal line (b) at rest (3A and B) and at straining (3C and D) in control group. the paradoxical closure of ARA at straining can be clearly seen.

relax puborectalis muscles because of the "unfamiliar and unphysiologic circumstances of the laboratory."[10]

Proctograms are considered more accurate than perineometry, a nonradiologic technique used for measuring perineal descent at straining.[11,12]

The distance between the ARA and pubococcygeal line was significantly higher at straining than at rest in both Groups A and B.

The sex and age of the control group make it difficult to correctly compare it to the pathologic groups. Furthermore, the control group includes few subjects; in fact, only five people volunteered.

In our series of selected, constipated patients, an intestinal TT test demonstrated a serious delay of expulsion of radiopaque markers in all subjects. However, no difference was found for the stasis in the sigmoid rectum.

We believe that a severe alteration of the pelvic floor causes difficult defecation, but how can we explain the

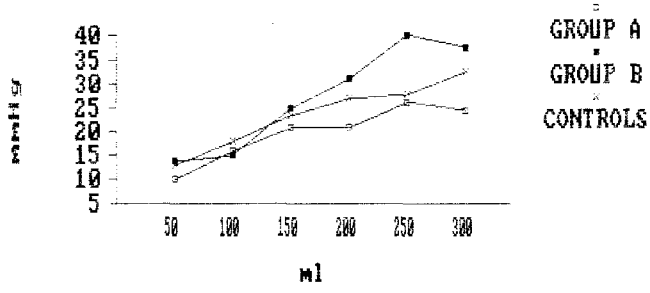
TABLE 3. *Manometric Results*

		APR, mm Hg	AL, cm	RT, ml	PRS, ml	IRAIR, ml	RAIR, ml
Controls	X	74	3.6	17.1*	328.6	10.0	120.0
	DS±	25.6	1.0	4.9	75.6	0.0	48.3
Patients	X	61.3	3.0	64.1*	347.6	27.6	128.9
	DS±	27.3	8.0	56.9	107.8	23.9	88.1

* $P < 0.01$.

APR: Anal pressure at rest; AL: anal canal length; RT: rectal threshold; PRS: painful rectal sensation; IRAIR: initial rectoanal inhibitory reflex; RAIR: constant rectoanal inhibitory reflex (1 m').

TABLE 4. *Results of Rectal Compliances**



*No statistical difference was found among the three groups.

TABLE 5. *Anorectal Angle Degrees of the Three Groups in Different Positions at Proctography*

		C	R	S
Controls	X	104.5	118.4	120.6†
	DS±	21.6	11.4	13.0
Group A	X	103.8	114.6*	122.2‡
	DS±	14.6	13.9	18.5
Group B	X	101.6	120.1*	101.2†,‡
	DS±	13.0	15.9	15.6

*$P < 0.01$; †$P < 0.05$; ‡$P < 0.02$.
R: at rest; C: contraction; S: straining.

TABLE 6. *Distance (mm) between Anorectal Angle and Pubococcygeal Line at Proctography*

		C	R	S
Controls	X	2.4*	18.4‡	45.4
	DS±	7.5	17.0	22.9
Group A	X	10.3	20.2†	34.7†
	DS±	11.0	11.5	14.5
Group B	X	27.4*,†	39.4†,‡	64.7†
	DS±	15.7	17.6	25.4

*$P < 0.05$; †$P < 0.05$; ‡$P < 0.06$.
R: at rest; C: contraction; S: straining.

few patients with rectal stasis, especially in Group B? One hypothesis is that, at the beginning, almost all our patients had "colonic" constipation and their continuous attempts to defecate by severe straining progressively damaged the pelvic floor muscles. This can also explain the older age of the patients (Group B) with more severe alterations of the anorectal angle at straining.

Many investigators found that other intestinal disorders may be present in constipated patients: alterations of the gastrocolic reflex, motility of the esophagus, and/or of gastric emptying.[13] This proves that constipation can affect the entire intestinal tract.

Conservative treatment in patients with colonic and pelvic alterations is often frustrating for both patient and doctor. When a surgical approach is decided, colectomy and ileorectal anastomosis appears to be the best treatment.[14]

In conclusion, patients with severe constipation can also have colonic or rectal stasis, and/or high rectal threshold, alteration of the anorectal angle and of its distance from the pubococcygeal line, paradoxical contraction of the puborectalis muscle at straining, and or rectocele.

Proctographic examination demonstrates abnormal static and dynamic situations of the pelvic floor, and allows us to measure those alterations. It must, however, always be associated to at least intestinal TT and anorectal manometry to correctly evaluate constipation, which cannot be correlated to proctographic severity.

References

1. Preston DM, Lennard-Jones JE, Thomas BM. The ballon proctogram. Br J Surg 1984;71:29-32.
2. Kiff ES, Barnes PR, Swash M. Evidence of pudendal neuropathy in patients with perineal descent and chronic straining at stool. Gut 1984;25:1279-82.
3. Preston DM, Lennard-Jones JE. Anismus in chronic constipation. Dig Dis Sci 1985;30:413-18.
4. Meunier P, Marechal JM, Jaubert de Beaujeu M. Rectoanal pressures and rectal sensitivity studies in chronic childhood constipation. Gastroenterology 1979;77:330-6.
5. Read NW, Timms JM, Barfield LJ, Donnelly TC, Bannister JJ. Impairment of defecation in young women with severe constipation. Gastroenterology 1986;90:53-60.
6. Baldi F, Ferrarini F, Corinaldesi R, et al. Function of the internal anal sphincter and rectal sensitivity in idiopathic constipation. Digestion 1982;24:14-22.
7. Turnbull GK, Lennard-Jones JE. Failure of rectal expulsion as a cause of constipation: why fibre and laxatives sometimes fail. Lancet 1986;5:767-9.
8. Kuijpers HC, Bleijenberg G, De Morree H. The spastic pelvic floor syndrome: large bowel outlet obstruction caused by pelvic floor dysfunction: a radiological study. Color Dis 1986;1:44-8.
9. Shouler P, Keighley MR. Changes in colorectal function in severe idiopathic chronic constipation. Gastroenterology 1986;90:414-20.
10. Jones PN, Lubowski DZ, Swash M, Henry MM. Is paradoxical contraction of puborectalis muscle of functional importance? Dis Colon Rectum 1987;30:667-70.
11. Henry MM, Parks AG, Swash M. The pelvic floor musculature in descending perineum syndrome. Br J Surg 1982;69:470-2.
12. Oettle GJ, Roe AM, Bartolo DC, Mortensen NJ. What is the best way of measuring perineal descent? A comparison of radiographic and clinical methods. Br J Surg 1985;72:999-1001.
13. Reynolds JC, Ouyang A, Lee CA, Baker L, Sunshine AG, Cohen S. Chronic severe constipation: prospective motility studies in 25 consecutive patients. Gastroenterology 1987;92:414-20.
14. Preston DM, Hawley PR, Lennard-Jones JE, Todd IP. Results of colectomy for severe idiopathic constipation in women (Arbuthnot Lane's disease). Br J Surg 1984;71:547-52.