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Motility effects of anterior resection of the rectum performed for diverticular disease*

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Key Words: diverticular disease, colonic motility, anterior resection, rectum

Colonic motility study was performed in fiftyfive patients with symptomatic complicated diverticular disease, who underwent semielective surgery, and in twenty healthy volunteers.
The pressure sensors were positioned in the descending and the true sigmoid colon.
The colonic motility index was significantly higher in patients with symptomatic complicated diverticular disease than in controls in the basal ($p < 0.001$) and post-prandial periods ($p < 0.001$).
Three months after anterior resection of the rectum with wide resection of descending colon the motility index was significantly reduced ($p < 0.001$) in comparison to that before treatment; all patients were asymptomatic.
Three years and five years later, the manometric findings continued to be stable and the patients continued to be asymptomatic.
These data suggest that anterior resection of the rectum (with wide resection of the descending colon) lowers intraluminal pressure significantly and this effect appears long lasting.

Introduction

Diverticulosis of the colon, a common condition in Western countries, seems to be epidemiologically correlated with ageing and low fibre diet. [1]

From a pathogenetic point of view the formation of diverticula must involve a pressure gradient between the colonic lumen and serosa and areas of weakness in the colonic wall.

Even if patients with asymptomatic diverticular disease (ADD) have a normal colonic intraluminal pressure (other undetected mechanical events could produce mucosal herniation), a high percentage of patients with symptomatic uncomplicated diverticular disease (SUDD) or symptomatic complicated diverticular disease (SCDD) show a hypermotility of the colon.

If excessive intraluminal pressure is the important factor in the genesis of SCDD disease [7,2], it follows that operations for SCDD may have to be judged on their ability to reduce this for a significantly long period of time.

For this reason it seemed important to define the effect of anterior resection of the rectum performed for diverticular disease in terms of motility and to determine how long the effects last.

Material and Methods

Colonic motility was studied in 55 patients with SCDD who underwent semi-elective sur-

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gery (the operation of choice was anterior resection of the rectum with wide resection of the descending colon and preservation of the inferior mesenteric artery). Four patients had a colovesical fistula, two a colocolonic fistula, six a moderate bowel obstruction and the remaining 43 had peridiverticulitis.

Twenty healthy volunteers, matched for age and sex, constituted the control group.

Two open-ended catheters (intraluminal diameter 1.5 mm) were introduced into the bowel lumen through the biopsy channel of the colonoscope so that the tips were ~ 65-55 cm and ~ 50-40 cm from the anal margin. They were connected to pressure transducers (Statham P232B) and perfused with distilled water using a hydraulic perfusion system (Intraflo' CFS-03F). The manometric system had a pressure rise rate of 100 mmHg/sec. All pressure recordings were made with the patients in a semi-recumbent position. After a 30 minute pause, intraluminal pressure recordings were measured for three hours before and three hours after a standard meal (1000 Kcal). The pressure recordings were analysed with respect to a) motility index, b) percentage duration of activity, c) mean amplitude, d) total number of waves and e) number of waves exceeding 50 mmHg. Pressures of less than 10 mmHg were ignored for the purpose of analysis. All calculations were carried out by one of the authors. Results were expressed as the mean ± SE; statistical analysis was performed using the paired Student's t test. Calculations were made with the Statgraphic statistical package. [8] The manometric study was performed before surgery, as well as three and thirtysix months after surgical treatment. The postsurgical manometric study was performed positioning the pressure sensors in the descending colon, 10 and 20 cm above the anastomosis. (Fig. 1)

Twenty patients were also re-examined five years later. All patients continued their normal daily diet before and after surgery.

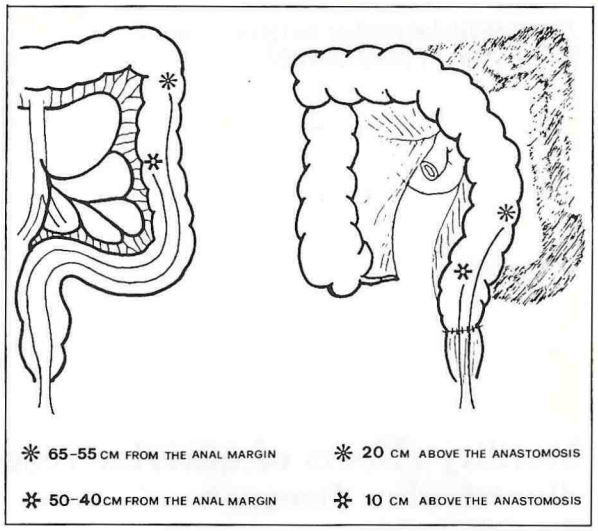

Fig. 1. *Positioning of the pressure sensors in the descending colon.*

Results

Forty-two out of 55 patients (76.3%) (mean age 51.1 ± 2.02 years) with SCDD had a motility index significantly higher than that of the controls in the basal ($p < 0.001$) and

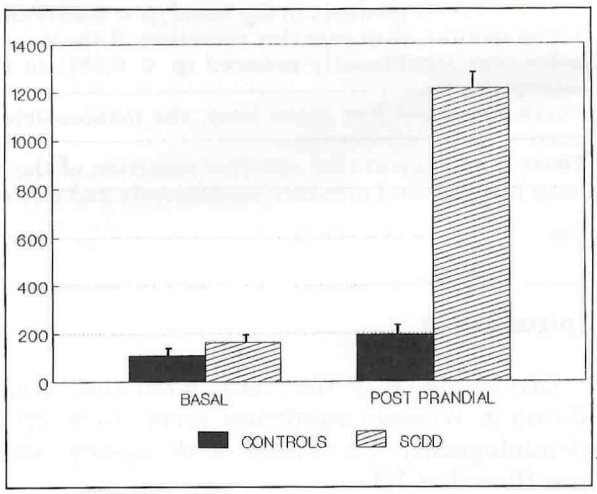

Fig. 2. *Motility index (mean* ± SE)

Table 1. *Motility index (mean* ± SE)

		BASAL (MEAN ± SE)		*POSTPRANDIAL (MEAN ± SE)*	
	N.	*M.I.*	*MAX. AMPL.*	*M.I.*	*MAX. AMPL.*
CONTROLS	20	107.46 ± 8.77	35.22 ±4.2	193.26 ± 18.19	53.33 ± 8.33
SCDD	55	163.05 ± 29.87	103.33 ± 8.12	1212.04 ± 87.29	115.41 ± 5.82
SCDD vs CONTROLS		$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$

Table 2. *Manometric findings after surgery*

	BASAL (MEAN ± SE)		*POSTPRANDIAL (MEAN ± SE)*	
	M.I.	*MAX. AMPL.*	*M.I.*	*MAX. AMPL.*
SCDD before surgery	163.05 ± 29.87	103.33 ± 8.12	1212.04 ± 87.29	115.41 ± 5.82
SCDD 3 months after surgery	28.46 ± 9.9	28.00 ± 5.5	36.96 ± 10.8	45.20 ±8.7
SCDD 3 years after surgery	24.90 ± 19.1	29.12 ± 2.53	41.45 ± 9.75	58.12 ±6.01
SCDD 5 years after surgery	30.10 ± 6.20	29.00 ± 3.48	37.01 ± 7.12	48.20 ±5.15

postprandial periods ($p < 0.001$) (Table 1, Fig. 2). Maximal amplitude of intraluminal pressure was significantly higher in SCDD than in controls during the fasting ($p < 0.001$) and postprandial periods ($p < 0.001$) (Table 1, Fig. 3). High amplitude pressure peaks frequently exceeded 120 mmHg (Fig. 3).

Three months after anterior resection the motility index and maximal pressure amplitude was significantly reduced ($p < 0.001$) in comparison to those taken before treatment (Table 2, Fig. 4). All patients were asymptomatic.

Three years later, the manometric findings continued to be stable (Table 2, Fig. 4) and the patients continued to be asymptomatic (some reported slight constipation as before surgery).

Five years later, the motility index and maximal pressure amplitude remained at normal values. (Table 2, Fig. 4)

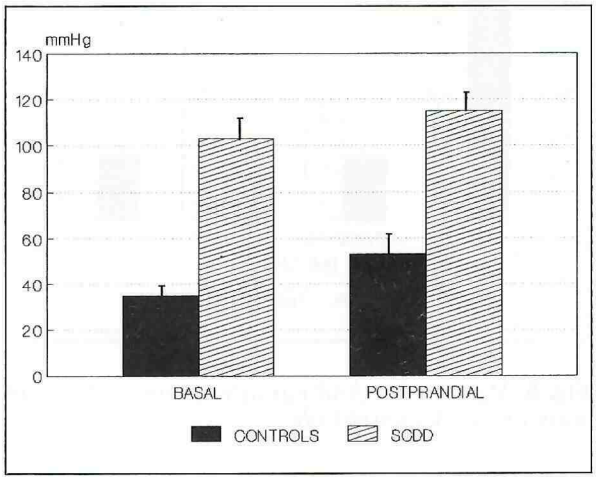

Fig. 3. *Maximal amplitude (mean* ± SE)

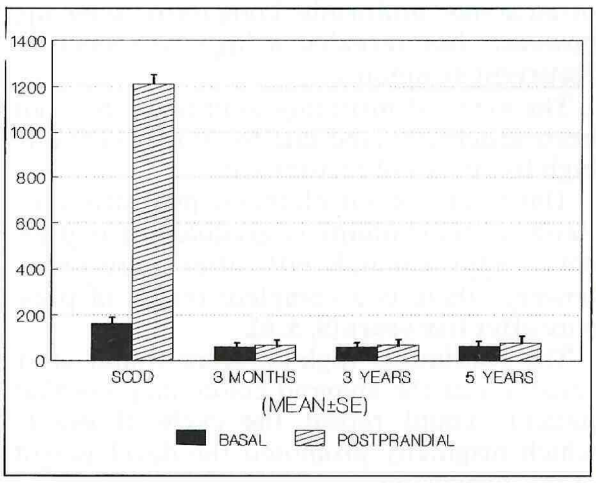

Fig. 4. *Manometric findings after surgery. Motility index*

Discussion

It is generally agreed that two types of diverticular disease exist; the first is associated with a normal motility index (ADD), the second with an increased motility index (SUDD, SCDD).

Whereas the former requires no treatment, surgical treatment seems to be mandatory for the letter. Surgery is indicated for the SUDD groups only if the risk markers for complicated diverticular disease exist. (Table 3) [3]

With regard to surgical treatment it is necessary to distinguish between elective or semi-elective surgery and emergency surgery. An analysis of recent literature on emergency surgery for septic complications of diverticular disease indicated that resection (preferably in the form of Hartmann's procedure) shows a clear advantage over operations in which the colon remains in the abdomen, i.e., colostomy with drainage [5].

As far as elective or semi-elective surgery is concerned the resection of the sigmoid colon

Table 3. *Indicators of a risk group for SCDD*

1) Age ~ 50 years
2) Short history of left lower quadrant abdominal pain
3) Short segment of colon with diverticula
4) Elevated motility index (pressure amplitude exceeding 120 mmHg)

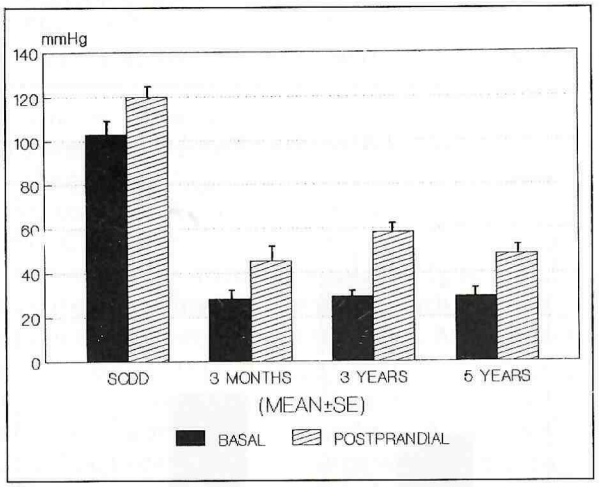

Fig. 5. *Manometric findings after surgery. Pressure waves maximal amplitude.*

has been performed in many centres and favorable short - term results have been reported almost uniformly. Long term follow-up, however, has revealed a high frequency of recurrent symptoms.

The sigmoid myotomy alternative has not been widely adopted due to an unacceptably high-frequency of recurrence.

The return of intraluminal pressure after Reilly's colomyotomy is gradual but is present in approximately 60% after three years; however there is a complete return of pressure after five years [9, 5, 6].

The continuing high-pressure found after resection of the sigmoid colon suggests that patients could repeat the cycle of events which originally promoted the development of the diverticula.

The motility approach to diverticular disease helps to clarify this situation.

The observation that the hypermotility is not limited to the sigmoid colon but often involves the descending and sometimes the transverse colon [4], suggests that it may be worthwhile extending the upper limit of colonic resection.

In our opinion the anterior resection of the rectum with a wide resection of the descending colon is the treatment of choice for diverticular disease in elective or semielective conditions.

The failure of resection to change intraluminal pressure means that the resection is inadequate.

Smith et al (1974) suggested that, when indicated, the surgical treatment of patients with diverticular disease, appears to be important [9]; however it is also essential to restore fibres to their diet.

In our experience, bran cannot reverse the failure of limited resection to change intraluminal pressure. In these cases, it seems necessary to re-operate.

In conclusion the anterior resection of the rectum (with a wide resection of the descending colon) lowers the intraluminal pressure significantly and this effect appears to be long lasting.

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Italian Abstract – Risultato a distanza della resezione anteriore del retto nel trattamento della malattia diverticolare del colon

È stata studiata la capacità della resezione anteriore del retto di ridurre la pressione endocolica che risulta quasi sempre elevata nella malattia diverticolare complicata.

Lo studio manometrico del colon è stato condotto, sia in condizioni basali che dopo stimolo (pasto di 1000 Kcal), mediante cateteri posizionati nel colon discendente e nel sigma. Sono stati calcolati l'indice di motilità, la durata percentuale di attività motoria e la pressione endocolica massima. Tale approccio ha confermato le alte pressioni endocoliche che caratterizzano la malattia diverticolare complicata e la efficacia della resezione anteriore del retto nel ridurle significativamente e durevolmente.

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