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ORIGINAL ARTICLE

F. Pucciani • L. Iozzi • A. Masi • F. Cianchi • C. Cortesini

Multimodal rehabilitation for faecal incontinence: experience of an Italian centre devoted to faecal disorder rehabilitation

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Abstract Background Sphincter exercises and biofeedback therapy have been used to treat faecal incontinence but results have been unpredictable and standards of treatment have not yet been established. The aim of this study was to retrospectively evaluate the effects of a new multimodal rehabilitation model on faecal incontinence. **Methods** All of the rehabilitative procedures are guided by manometric data. Primary study outcome criteria were the determination of changes or deterioration in incontinence, failure to achieve full continence and/or presence of faecal urgency. The clinical outcome was designed according to the Jorge-Wexner incontinence score. **Results** Between 1997 and 2001, one hundred forty-nine incontinent patients (85 F and 64 M; age range, 41–73 years; mean age, 60.6 years) underwent multimodal rehabilitation at our outpatient unit. The overall mean incontinence score had significantly improved after treatment ($p<0.001$), and 58 patients (38.9%) were symptom free. No patient reported any deterioration in incontinence. Faecal urgency persisted in 23 patients (15.4%). **Conclusion** In conclusion, multimodal rehabilitation, using manometric study, can modify the incontinence score.

Key words Faecal incontinence • Rehabilitation • Biofeedback • Pelviperineal kinesitherapy • Electrostimulation

F. Pucciani (✉) • L. Iozzi • A. Masi • F. Cianchi • C. Cortesini
Coloproctology Unit of Careggi-Florence
Department of General Surgery
University of Florence
Viale Morgagni 85, I-50134 Florence, Italy
E-mail: pucciani@unifi.it

Introduction

Faecal incontinence can be an embarrassing and disabling condition. Those who suffer from it often pay dearly in a social setting. There may also be financial burdens for the individual and for his or her family as the condition can require placement in a nursing home [1]. Sphincter exercises and biofeedback therapy have been used to treat faecal incontinence but results have been unpredictable and standards of treatment have not yet been established [2].

Since 1997, a new multimodal rehabilitation model has been in use at the Coloproctology Unit of Careggi-Florence, an Italian medical centre dedicated to the study and treatment of faecal disorders. The primary objective of the model is to improve retraining performance. Multimodal rehabilitation involves pelviperineal kinesitherapy, biofeedback, volumetric rehabilitation and/or electrostimulation. All of the rehabilitation procedures are guided by manometric data.

The aim of this study was to retrospectively evaluate the effects of the model on faecal incontinence. Primary study outcome criteria were the determination of changes or deterioration in incontinence, failure to achieve full continence and/or presence of faecal urgency.

Materials and methods

One hundred forty-nine incontinent patients (85 F and 64 M) (age range, 41–73 years; mean age, 60.6 years) from the outpatient unit of the Clinica Chirurgica of the University of Florence (Italy) underwent multimodal rehabilitation between 1997 and 2001. The mean rehabilitation period was 7 months.

We evaluated, bowel frequency, surgical operations, concomitant diseases and, in women, pregnancies and degree of genital relaxation [3].

Faecal incontinence was classified according to the Jorge-Wexner incontinence scale [4]: the scores range from 0 (full continence) to 20 (daily incontinence with concomitant alterations in

lifestyle). Clinical evaluation, physical examination and diagnostic tools (e.g. anal endo-sonography, pelvic floor electromyography, latency of sacral reflexes, and nuclear magnetic resonance) were used to identify the aetiology of incontinence (Fig. 1).

In order to guide the rehabilitation programme (Fig. 2), computerized anorectal manometry was carried out in all of the patients prior to and after the rehabilitation cycle using standard techniques [5]. Biofeedback and pelviperineal kinesitherapy [6] were indicated by low anal resting pressure (ARP, mean resting pressure, P_m<30 mmHg; normal values in our laboratory, 41.8±6.6 mmHg) or weak maximal voluntary contraction (MVC) with low amplitude (A≤70 mmHg; normal values, 124.1±3.7 mmHg) and short duration (T≤10 seconds; normal values, 24.3±7.3 seconds). Volumetric rehabilitation [7] was indicated for impaired (≤20 ml) or delayed (>80 ml) conscious rectal sensitivity threshold (CRST) (normal values, 40±10 ml), was treated by volumetric rehabilitation [7]. Low maximal tolerated volume (MTV) (≤130 ml; normal values, 201.3±19.4 ml) and impaired compliance of the rectum (ratio mmHg/ml >0.5) were considered manometric signs for rehabilitative treatment using volumetric rehabilitation. Electrostimulation was used as the preliminary step for biofeedback and kinesitherapy when patients needed improved sensation of the anoperineal plane [8].

According to the multimodal rehabilitation model (Fig. 1), the usual sequence of procedures is: (1) volumetric rehabilitation; (2) electrostimulation; (3) biofeedback and (4) pelviperineal kinesitherapy. The sequence is adjusted according to the manometric reports of each patient. Therefore, it is aimed at the multifactorial mechanisms of incontinence. This model has resulted in individualised cycles of rehabilitation. The algorithm for the rehabilitation management is reported in Figure 2.

Patients did not use any drugs or medical devices (e.g. anal plugs) during the rehabilitative period.

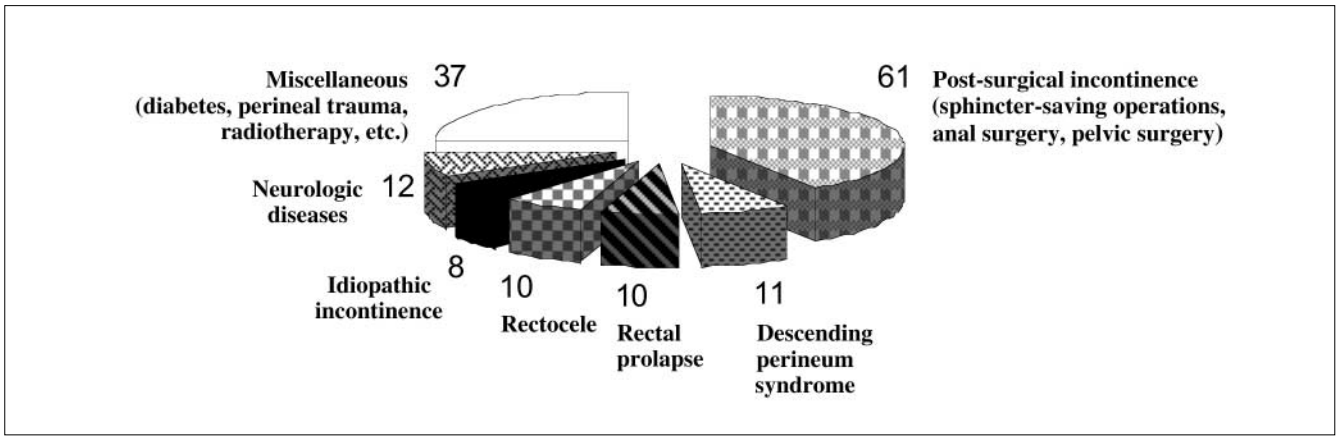


Fig. 1 Aetiology in 149 patients affected by faecal incontinence

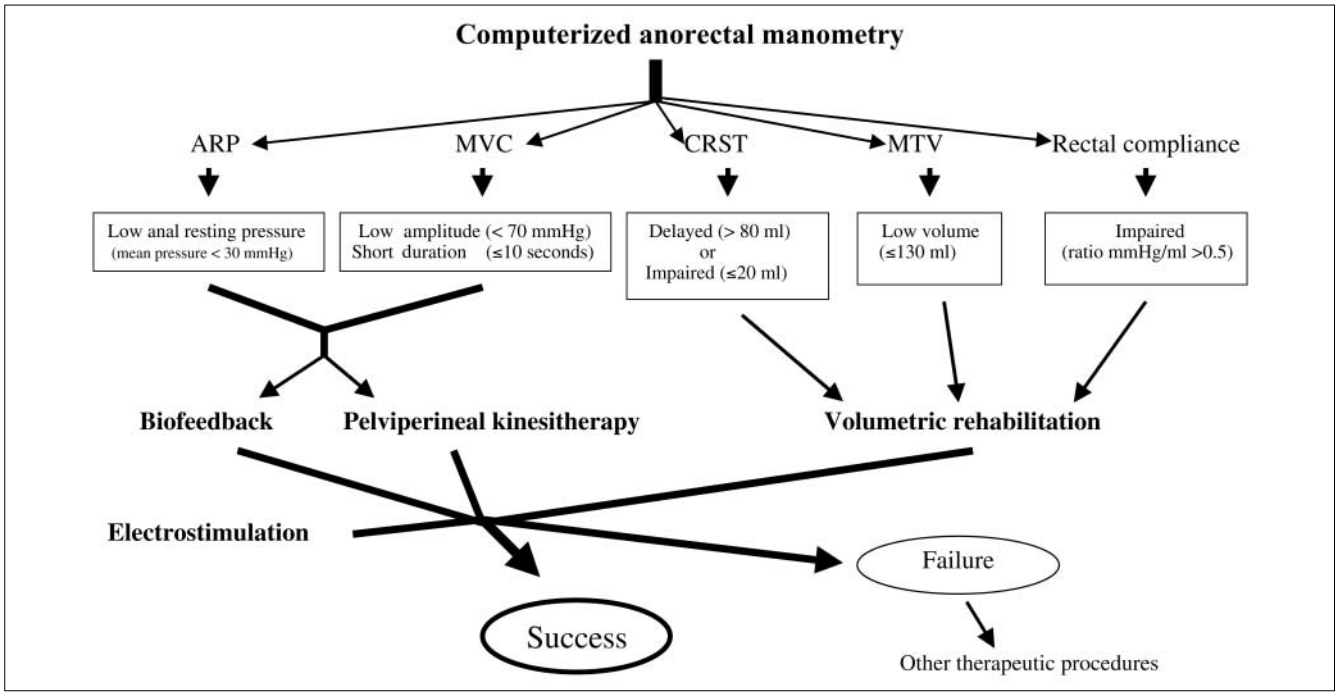


Fig. 2 Algorithm for a multinodal rehabilitation programme for faecal incontinence. *ARP*, anal resting pressure; *MVC*, maximal voluntary contraction; *CRST*, conscious rectal sensitivity threshold; *MTV*, maximal tolerated volume

A control group for manometric studies consisted of 10 healthy subjects. Their results were compared to those of 149 incontinent patients both before and after rehabilitation. All of the participants in the study gave written consent after a clear and thorough explanation of the programme had been presented.

Volumetric rehabilitation

The principles of volumetric rehabilitation (VR) are based on the mechanical distension of the rectum. The aim of this technique is to restore the impaired rectal sensation and/or rectal capacity and/or rectal compliance.

The technique involves the administration, twice daily, of a tepid water enema. The initial volume equals the manometric MTV. The subject is asked to hold the liquid using the strongest anal contraction possible for the longest period of time. When the patient becomes able to retain the contents for more than 30 seconds, the second step begins. Enema volume is increased and the patient is again asked to hold the water using maximal sphincteric contractions. When full continence has been obtained for more than 30 seconds, the third step begins using the same modalities: increases in enema volume are gradual (30 ml per increase). Volumetric rehabilitation is usually continued until anorectal training allows for full continence of 180–200 ml water.

In the presence of a delayed rectal sensation, the aim of volumetric rehabilitation is to restore a lower conscious rectal sensitivity threshold to near normal volume. The sequential order involves the step by step use of enemas with decreasing cubic units (30 ml) until the patient has again achieved normal rectal sensations.

Patients are instructed to self-administer the enemas at home.

Electrostimulation

Patients are instructed to self-administer electrical stimulation (ES) with an anal plug probe (Uroldem; D.E.M. SAS, Turin, Italy). The device delivers a square wave of current alternating between a 5- to 6-second work period and a 10- to 12-second rest period. Anal electrostimulation is performed for three months according to a standard sequence (Table 1).

Biofeedback

Biofeedback (BF) is performed using Contimed manometric equipment (Hollister, Libertyville, IL, USA). Once its function has been explained, the patients use the equipment twice a day for 20 minutes, at home. Patients are required to perform a maximal voluntary contraction using the anal muscles: feedback is noted by changes in the coloured lights on the Contimed meter. The sessions last one month.

Pelviperineal kinesitherapy

Pelviperineal kinesitherapy (PK) is a specific muscular re-education technique for pelvic floor muscles. This type of muscular training works particularly well on the levator ani**,** by improving performance, extension, and elasticity [9]. It is useful when descending perineum syndrome [10] or defects in pelvic floor support are present in patients with faecal incontinence.

The cycle of pelviperineal kinesitherapy follows a standard sequence of 7 sessions. It is adapted to the individual patient. During each session, two essential steps are taken: the exercises of the last lesson are reviewed and new exercises are introduced to maintain continuity of the training programme. Patient response can thus be accurately determined. The sessions of pelviperineal kinesitherapy are:

Session I
- Preliminary lesson on relaxed breathing and corporeal consciousness (used at the start of all sessions)
- Diaphragmatic breathing
- Marking of perianal area, made easier by peri- and intra-anal digital manipulation
- Location and focusing on agonist, antagonist, and synergic muscles on the perianal plane

Session II
- Anteversion and retroversion pelvic movements
- Short anal contractions
- Exercises for short periods of anal relaxation
- Perianal and perivaginal stretching
- Stretch reflexes of the puborectal muscles (elicited by the therapist). During the reflexes, there are simultaneous voluntary anal contractions

Session III
- Perianal and perivaginal stretching
- Stretch reflexes of the puborectal muscles
- Prolonged anal contractions
- Explanation of abdominal press principles of the diaphragm, pelvic floor, abdominal wall, para-vertebral muscles and iliopsoas

Session IV
- Perianal and perivaginal stretching
- Stretch reflexes of the puborectal muscles.
- Prolonged anal contractions

Table 1 Standard sequence for anal electrostimulation

Period (n. days)	Pulse		Daily program	
	Width (ms)	Frequency (Hz)	Duration (min/day)	Frequency
20 days	0.5	10	10	Twice daily
20 days	1.0	15	10	Once daily
25 days	1.25	25	10	Every other days
25 days	1.5	50	10	Every 2 days

- Abdominopelvic synergy. The abdominal press force vectors are directed to the posterior perineum while simultaneous voluntary sphincteric anal relaxation occurs

Session V
- Abdominopelvic synergy and simulation of defecation with slight pelvic floor descent (used from this session until the end of the cycle)
- Consciousness reinforcement with the correct execution of anal contractions

Session VI
- Anal corticalisation stage: some anal contraction exercises are introduced (bending down, coughing, and Valsalva's manoeuvre in supine, upright and sitting positions)
- Visual control of pelvic floor descent using a mirror

Session VII
- Response modulation: gradualness in sphincteric recruitment and inhibition
- Visual control of pelvic floor descent using a mirror
- Anal corticalisation stage.

Clinical outcome criteria

The clinical outcome was based on the Jorge-Wexner incontinence scale [4]. Results were organised into classes: *Class I*, excellent results (Jorge-Wexner score ≤3); *Class II*, good results (scores >3 and ≤6); *Class III*, moderate success (Jorge-Wexner scores >6 and ≤10); *Class IV*, poor results (incontinence score unchanged or >10).

Statistical analysis

Student's *t* tests for paired and unpaired samples were used.

Results

The study was undertaken after a median follow-up of 28 months (range, 10–46 mo). Table 2 shows the clinical characteristics of the 149 patients.

The mean duration of incontinence was 33.6 months (range, 7–81 mo). All patients used pads: mean weekly cost was about 3.5 euro. Obstetric tears and/or episiotomy were recorded in 53 women (62.3%) and gynaecologic problems were present in 43.5%: 34.1% had undergone previous hysterectomy and 9.4% had uterine prolapse. The oldest patient was 73 years of age.

All 149 patients used the multimodal rehabilitative approach: none of them had used only one rehabilitative technique. Sixty-eight patients underwent all the four rehabilitative procedures. Seventy-one subjects used three techniques (32 patients, VR + BF + PK; 15 patients, ES + BF + PK; 24 subjects, VR + ES + BF), and 10 patients were treated only with biofeedback and pelviperineal kinesitherapy. The results following the rehabilitative cycles are reported in Table 3.

The overall mean incontinence score had significantly improved after treatment ($p<0.001$, Table 3). Both men and women showed significant improvement ($p<0.001$), but patterns of continence were different. The women had significantly higher scores both before and after treatment ($p<0.001$).

Clinical outcome is reported in Fig. 3. There were 132 patients (89%) in Classes I and II; 58 of them were symptom free (38.9% of all patients). Five women had Jorge-Wexner scores above 10 and 3 patients showed no clinical change (Class IV). Three Class IV patients had had severe orthopaedic problems such as pelvic fractures, slipped disks and vertebral fractures. One of the three patients who showed no post-rehabilitative clinical change had systemic sclerosis; the other two showed bilateral signs of delayed latency of the sacral reflexes. Faecal urgency persisted in 23 patients (15.4%). No patient reported any deterioration in incontinence.

Figure 4 shows mean pre- and post-rehabilitative incontinence scores, according to the different clinical conditions of the subjects. The worst results were obtained in patients affected by rectal prolapse (pre-rehabilitation incontinence score 11.6±5.5 vs. post-rehabilitation score 8.8±2.8) and in patients who had undergone sphincter-saving operations (low anterior resection of rectum, with colorectal anasto-

Table 2 Clinical evaluation. Values are mean (SD)

Age, years	60.6±9.8
Stool frequency, n/week	5.7±1.9
Liquid stools, n patients/total patients	18/149
Pads, n/week	10.3±3.2
Deliveries, n	1.6±0.3
Obstetric tears, n female patients/total female patients	43/85
Episiotomy, n female patients/total female patients	15/85
Cystoceles, n female patients/total female patients	17/85
Uterine prolapse, n female patients/total female patients	8/85
Hysterectomy, n female patients/total female patients	29/85
Urinary incontinence, n patients/total patients	61/149

Table 3 Cumulative Jorge-Wexner incontinence scores before and after rehabilitation. Values are mean (SD)

	Pre-rehabilitation score	Post-rehabilitation score
Total patients, n=149	11.20 (4.29)	2.65 (1.29)*
Women, n=85	11.50 (4.04)	4.40 (2.60)*
Men, n=64	7.70 (2.16)	1.66 (0.60)*

*$p<0.001$ vs. pre-rehabilitation score

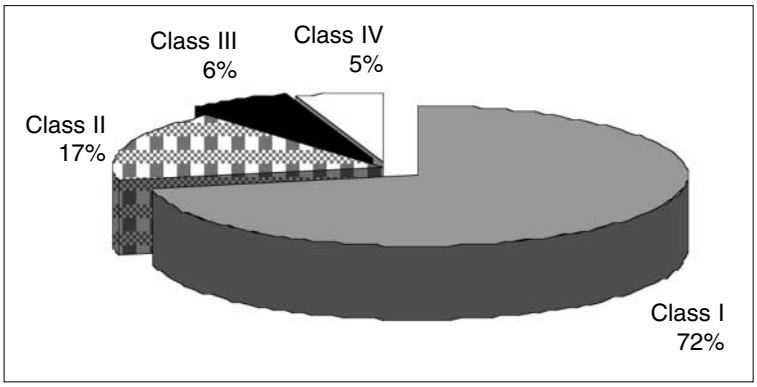


Fig. 3 Clinical outcome of multimodal rehabilitation in 149 patients. Post-treatment results are organized in classes (see text)

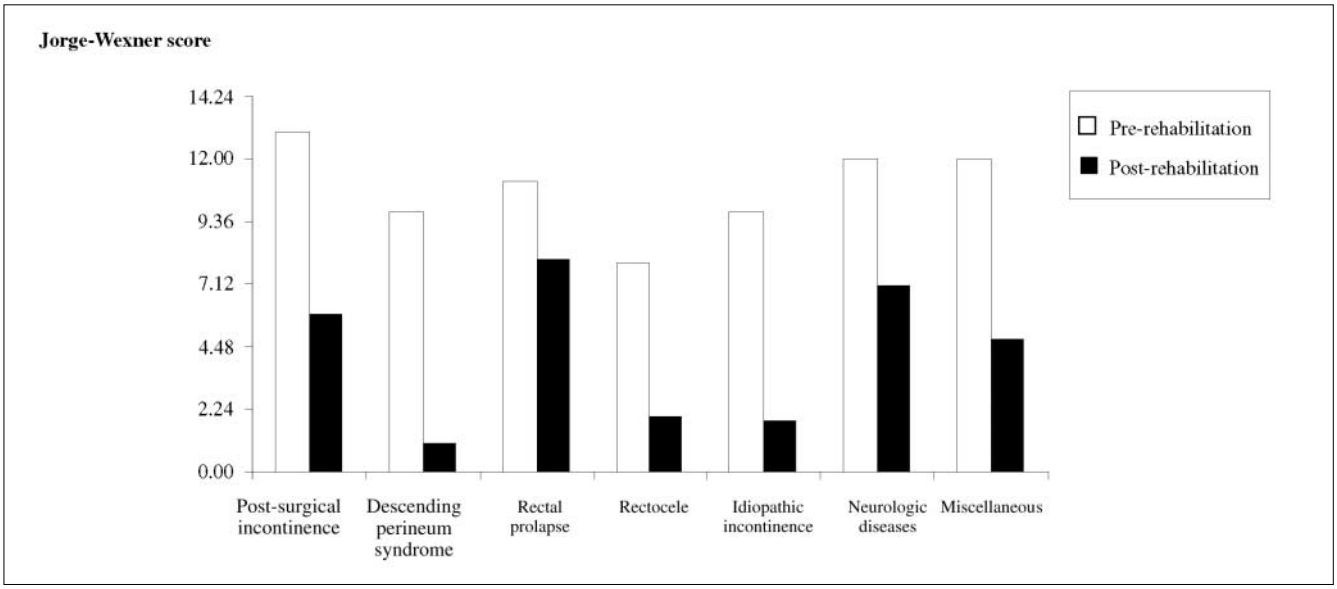


Fig. 4 Pre- and post-rehabilitative Jorge and Wexner scores according to aetiology

mosis or coloanal anastomosis; restorative proctocolectomy with ileal pouch). Those who had had a restorative proctocolectomy with ileal pouch had the highest pre-rehabilitation scores (13.1±5.8), which became 9.6±2.7 after the rehabilitation cycles (3 patients in Class III, 2 patients in Class IV).

Anal canal pressures are reported in Figure 5. After rehabilitation, anal canal pressures (mean and maximal anal resting pressures) had increased, but were still significantly lower than that of controls ($p<0.001$). After treatment, MVC showed no significant differences in amplitude when compared with pre-treatment values. MVC duration, which had been significantly shorter in patients than in controls before rehabilitation ($p<0.001$), returned to significantly normal values after treatment.

One hundred twenty-four patients underwent volumetric rehabilitation for the impairment of rectal sensation (Table 4). Before rehabilitation 106 subjects had signifi-

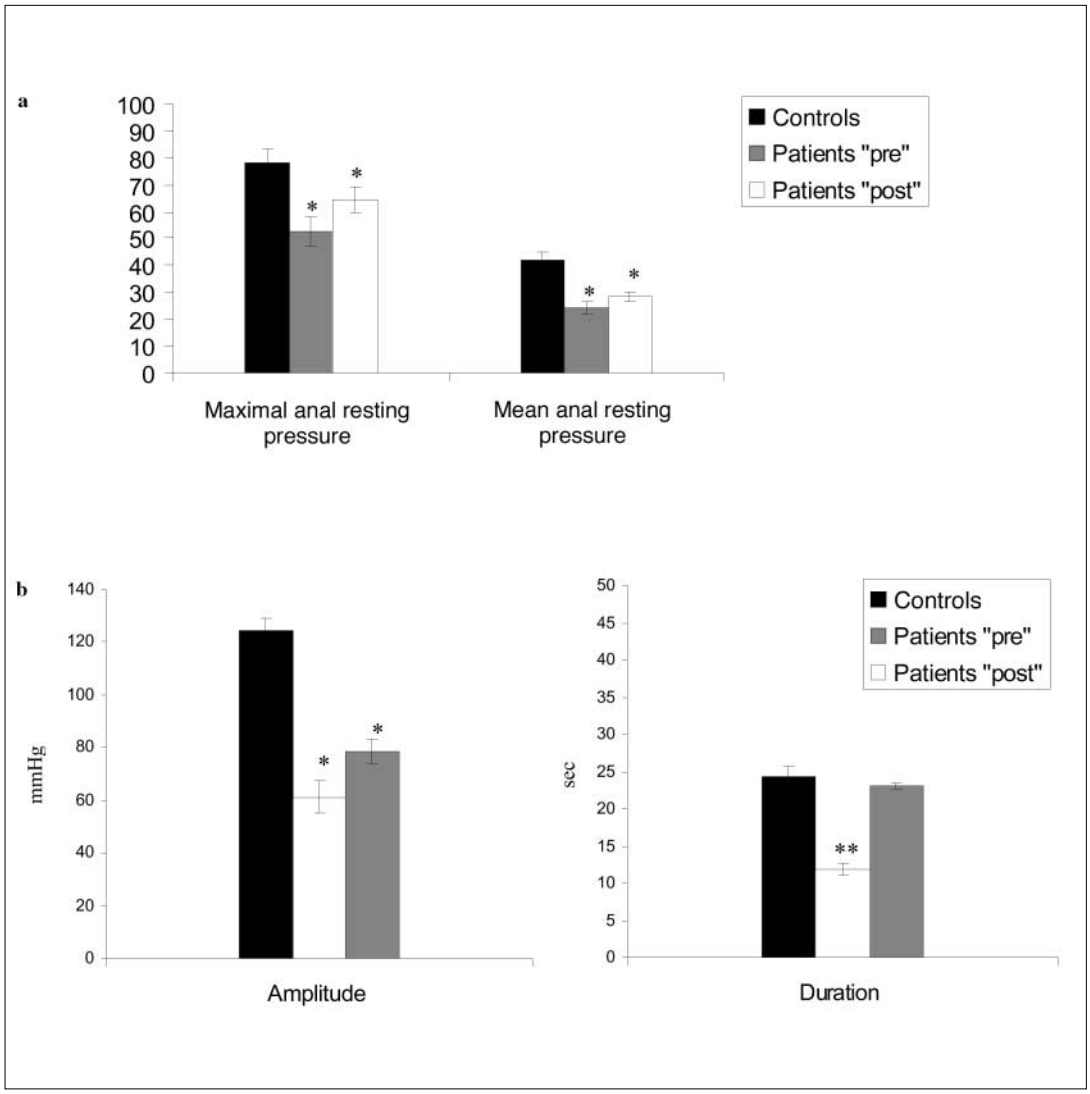


Fig. 5a Anal resting pressure. *Patients "pre" and patients "post" vs. controls ($p<0.001$). **b** Maximal voluntary contraction. *Patients "pre" and patients "post" vs. controls ($p<0.01$). **Patients "pre" vs. patients "post" and controls ($p<0.01$)

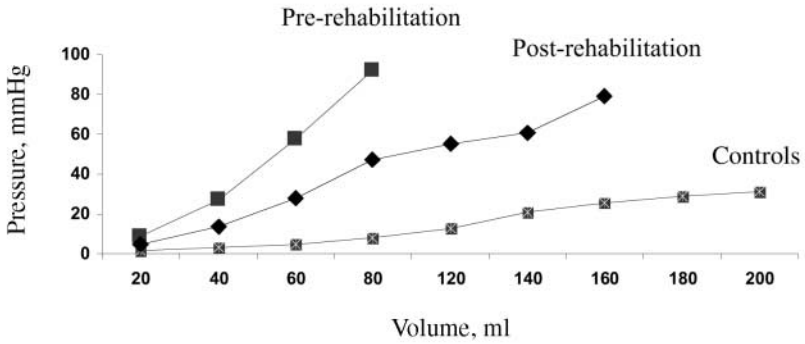
Table 4 Results of volumetric rehabilitation. Values are mean (SD)

	Controls	Patients	
		Before rehabilitation	Post rehabilitation
MTV, ml (n=43)	201.3 (19.4)	131.2 (16.6)[a]	197.7 (13.4)[b]
CRST, ml (n=106)	40.0 (10.0)	71.2 (8.6)[a]	43.4 (12.3)[b]

[a] $p<0.001$ vs. control
[b] $p<0.001$ vs. before rehabilitation

cantly higher CRST ($p<0.001$), when compared to controls; none of them had megarectum. Eighteen of 124 patients had lowest CRST (≤20 ml). MTV was significantly lower in 43 patients ($p<0.001$). After treatment, both manometric parameters returned to normal values: the values were significant (Table 4).

Neo-rectum compliance in 11 patients who had undergone sphincter saving operations is reported in Fig. 6. After volumetric rehabilitation, there was some improvement. The neo-rectum had acceptable response to the highest volumes, even if the response was persistently and significantly lower than that of controls ($p<0.001$).



Gradients (mmHg/ml)

	Pre-rehabilitation	Post-rehabilitation	Controls
20 ml	0.50	0.25	0. 04
40 ml	0.75	0.30	0.07
60 ml	1.00	0.40	0.12
80 ml	1.12	0.525	0.125
120 ml	/	0.475	0.133
140 ml	/	0.428	0.142
160 ml	/	0.50	0.153
180 ml	/	/	0.156
200 ml	/	/	0.165

Fig. 6 Pressure/volume curve

Discussion

The aetiology of faecal incontinence is multifactorial; some types of treatment are effective while others are not. Rehabilitative treatment of faecal incontinence is often the first therapeutic step towards faecal continence: many incontinent patients can be adequately managed. Biofeedback therapy, perineal exercises, electrostimulation, and rectal volume discrimination training are usually employed. At present, no single treatment can be considered the gold standard. As underlined by a recent Cochrane review, standards of treatment of the different procedures are still lacking and the magnitude of alleged benefits has yet to be established [2]. Our retrospective study (1997–2001) evaluated the results of multimodal rehabilitation with a new rehabilitative model. The use of each rehabilitative technique was based on the manometric reports of the individual patient given that each rehabilitative technique can modify specific aspects of faecal incontinence. Biofeedback was used when there was low anal resting pressure with impaired voluntary contractions: it can influence both the strength of the striated pelvic floor muscles and the threshold of the sphincter contraction [11]. Pelviperineal kinesitherapy was also carried out in the same patients especially when descending perineum syndrome was present. It is useful to co-ordinate the contractile activity of the pelviperineal muscles, particularly those of the levator ani. The rationale for the combined use of biofeedback and pelviperineal kinesitherapy is that the former is an operant conditioning tool that can offer strong cortical reinforcement while the latter is a muscular retraining programme that is accompanied by poor sensorial “consciousness”.

Volumetric rehabilitation is employed when there are manometric signs of impaired rectal sensation and/or rectal compliance. Retraining of the external sphincter response to rectal distension and improving the conscious sensory threshold have been documented as effective types of treatment for faecal incontinence in selected patients [7].

Within the design of the rehabilitation cycle, electrostimulation is used only as rehabilitative preliminary step in patients with severe impairment of the anal contraction. This technique can allow for some improvement in anal sensory awareness, perhaps by modifying anal compliance [12].

Our multimodal rehabilitation program was carried out in 149 patients with faecal incontinence due to different physical conditions. Faecal incontinence was classified according to the Jorge-Wexner incontinence score. Twelve incontinence scoring systems have been proposed to assist clinical decision making and post-therapeutic assessment of results [13]. Shelton and Madoff [14] tried to establish a uniform continence scale but did not succeed. The success rate of multimodal rehabilitation was high: 132 patients (89%) had excellent (Class I) or good (Class II) results, and 38.9% of all patients were symptom free after treatment. No patient reported any deterioration in incontinence: none had a post-rehabilitative score that was worse than the pre-treatment score.

The results of our study are quite difficult to explain. Anorectal manometric data showed that the duration of the anal voluntary contraction had improved significantly, after rehabilitation. This might have been due to the combined activity of biofeedback and pelviperineal kinesitherapy. Coordination of agonist, antagonist, and synergic muscles of the pelviperineal plane is the crucial voluntary step for correct and effective anal contractions. Good muscle recruitment appeared to go hand in hand with good muscle endurance (duration of contraction). However, the restoration of urge continence (>15 minutes) can be reached only if the capacity and elastic properties of the rectal reservoir are efficient.

Volumetric rehabilitation might have helped some patients with specific conditions: when it was used in patients with impaired rectal capacity, the maximal tolerated volume increased significantly. Nevertheless, urgency persisted in 23 patients (15.4%).

Unfortunately, two groups of patients seemed to have enjoyed little benefit from multimodal rehabilitation. Moderate to poor results were found in those patients affected by rectal prolapse and those who had had sphincter-saving operations. Both conditions create anatomic abnormalities of the pelviperineal and visceral planes: they do not seem to be effectively influenced by rehabilitation. Rectal "procidentia" is associated with the diastasis of the levator ani muscles. It is characterized by loss of posterior rectal fixation, loss of a horizontal distal rectal segment, and, in some patients, patulous anus. We have not found any way to conservatively correct these anatomical defects that are sometimes co-factors of faecal incontinence. Furthermore, several other factors may play important roles in this type of incontinence. Altered mucosal sensitivity, rectal "mass" effect, pudendal neuropathy, RAIR variations and rectal transit disorders may be present in patients affected by rectal prolapse. All these trigger points are not the targets of the rehabilitative techniques that are usually employed in multimodal rehabilitation. We have not been able to restore an acceptable level of function in incontinent patients with colo-anal anastomosis. A stiff neo-rectum, effect of anastomotic leakage and/or pelvic sepsis, implies that the capacity of the new reservoir is smaller than the original one that some impairment of the elastic properties of the walls has taken place. Unfortunately, liquid stools and the destruction of the anal sphincters can also take place such as the disruption of the anorectal sampling mechanism. Again, the multifactorial nature of incontinence is heavy. Of course, it may overwhelm the effects of multimodal rehabilitation, especially when some pathophysiologic factors are present which are not influenced by the rehabilitative procedures.

Recent articles have underlined the importance of sensory retraining in patients affected by faecal incontinence; the authors suggest that biofeedback may be useful for this purpose [11, 15]. Appropriate rectal sensations are determinant for good continence. In our study, 106 incontinent patients (71.1%) had high conscious rectal sensitivity thresholds. Their cortical recognition of the rectal contents occurred at higher volumes than in the controls. They had tardy voluntary reinforcement of the recto-anal excitatory reflex. As reported by Buser and Miner [7], retraining of the sensory threshold improves the external sphincter response to rectal distension. Reaching this goal is an important step in the rehabilitation of patients with impaired rectal sensation.

This retrospective study and its results suggested the need for a prospective evaluation to confirm the validity of the design of our multimodal rehabilitation model. It is the same one as that suggested for every new type of medical treatment. It is, however, strongly influenced by the well-known poor correlation between anorectal manometry and clinical symptoms [16]. The working of a predictive score index for the outcome of multimodal rehabilitation would be useful. We will also need to single out the predictive factors [17–19]. Facing the extent of these limits, we still believe that our experience can offer some advice and indications, as suggested by our therapeutic results.

In conclusion, the modulated multimodal rehabilitation may be useful in screening incontinent patients: "non-responders" to the rehabilitative program are surely in line for more expensive and extensive therapeutic procedures (e.g. sphincteroplasty, sacral neuromodulation, artificial sphincter, stoma). This reflection goes by what has proven by our study: (a) many incontinent people have been cured by multimodal rehabilitation; and (b) there has been no reported deterioration of incontinence even after unsuccessful rehabilitation.

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Invited comment

Conservative treatment is often recommended for faecal incontinence. Although the concept is well accepted among colorectal surgeons, only a limited number of physicians actually deal routinely with conservative training programs. Most often patients are referred to specially trained biofeedback nurses or physiotherapists for training for faecal incontinence but no exact treatment concept is specified. How the different treatment modalities actually work may be unknown. The paper by Pucciani et al. [1] presents a multimodal rehabilitation program for patients suffering from various kinds of faecal incontinence. One hundred forty-nine patients were retrospectively evaluated and treated according to the pre-treatment manometry findings. The rationale for this approach seems logical and this active group in Florence deserves congratulations for their contribution. Furthermore, a completely outpatient program for this condition is modern and cost effective. Their data show the poorest results for patients with sphincter defects and rectal prolapse, disorders which can be cured surgically. Unfortunately, this conservative program also did not work so well for the small group of patients suffering from faecal incontinence due to colo-anal or low colorectal anastomosis or after pouch surgery. The most promising finding, however, was that in no case did the patients conditions deteriorate. This paper reports promising results with a multimodal approach, although long-term results as well as further prospective studies are warranted.

J. Pfeifer
University of Graz
Graz, Austria

Reference

1. Pucciani F, Iozzi L, Masi A, Cianchi F, Cortesini C (2003) Multimodal rehabilitation for faecal incontinence: experience of an Italian centre devoted to faecal disorder rehabilitation. Tech Coloproctol 7:139–147