BIOFEEDBACK TRAINING FOR PATIENTS WITH MYELOMENINGOCELE AND FECAL INCONTINENCE

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Myelomeningocele is a congenital neural-tube defect which occurs in approximately 0·1 per cent of births (Freeman 1974, Elwood and Elwood 1980). As a result of aggressive medical and surgical treatment, 80 to 90 per cent of these children survive, so rehabilitation is increasingly important in their management. Fecal incontinence because of neurological impairment occurs in 90 per cent of these children (Brocklehurst 1976). Neurogenic impairment of the anal sphincter, with associated fecal incontinence, causes one of the most serious psychosocial problems. It is deprecated by the child's peers and family and is very damaging to the child's self-esteem. The odor of feces partly explains the poor social adjustment of many children born with myelomeningocele and may be an obstacle to the child attending an ordinary school (Chapman *et al.* 1979). Present therapy using stool-softeners, suppositories, scheduled toileting and/or manual removal are successful in many but not all of the children.

Several authors have reported on the efficacy of biofeedback in training patients with fecal incontinence secondary to myelomeningocele (Engel *et al.* 1974; Cerulli *et al.* 1979; Wald 1981, 1983; Whitehead *et al.* 1981; Shepherd *et al.* 1983). All used a three-balloon system developed by Schuster *et al.* (1965), which permitted simultaneous pressure measurements from the anal sphincters and rectum. The therapy consisted of making the patient conscious of previously unconscious body functions by recording and amplifying the body functions with electronic equipment. However, none of these authors used a control group to separate the effects of biofeedback from the effects of behavioral treatment, such as changes in bowel habits or diet.

The aims of this study were to determine (1) the efficacy of biofeedback training for fecal incontinence in patients with myelomeningocele, and (2) what anorectal abnormalities are present in these patients and which anorectal functions are conditioned during biofeedback training.

Material and method

The study population consisted of 12 patients with fecal incontinence due to myelomeningocele (eight boys and four girls aged seven to 21 years, mean 12 years) and of 16 control children (11 boys and five girls aged seven to 13 years, mean 10 years). The 12 patients were recruited from the Myelodysplastic Clinic at the University of Iowa, and were included in the study if they had fecal incontinence more than twice a week, if they were able to sense rectal balloon distention with 60ml of air, and if they could ambulate independently. The patients' characteristics are presented in Table I. All had had surgery for neural-tube defect and all had a neurogenic bladder.

The 16 controls were the children of staff of the University of Iowa, who volunteered for this study. These children had from two bowel movements per day to one every other day. They had no history of gastro-intestinal tract disease, and their physical examinations yielded normal results.

The study was approved by the Institutional Human Research Review Committee, and written, informed consent was obtained from the parents and the children.

Study design

A complete history was taken and physical examination was performed, and the frequency and consistency of bowel movements and soiling episodes was reviewed for the past week and the past two months. Patients were randomized by using sealed envelopes to assign them to treatment A (conventional therapy) or B (conventional therapy plus biofeedback). Behavior modification procedures (praise and treats) were used for both treatment groups to increase self-initiation of bowel movements. Laxatives or stimulants for stool evacuation (*e.g.* sennoside B, glycerine or bisacodyl suppositories) were given as needed to patients in both treatment groups. The patients were re-instructed and medications were adjusted during two follow-up visits.

Parents and patients were asked to keep diaries of fecal soiling. Anorectal manometry and a saline continence test were performed at the beginning of the study, and again between 35 and 77 days (mean 49 days) later. Six months and 12 months after the initial visit the patients and their parents were asked to fill out follow-up questionnaires, which included questions on medication use, stooling pattern, and frequency of soiling.

Treatment

Treatment A was conventional management: the children were instructed to try to defecate for five minutes four times daily on the toilet after each meal and after an afternoon snack. Treatment B consisted of conventional management plus three biofeedback training sessions, and these patients performed exercises of the perineum, using biofeedback, every other day. Biofeedback training was started immediately after the initial anorectal evaluation, using the three-balloon system developed by Schuster *et al.* (1965). A medium-sized system was used for the smaller patients and the adult-sized system for older patients.

During biofeedback training the patients were made aware of the lack of external sphincter contraction prior to internal sphincter relaxation, and of the abnormally weak or absent pressure increase during anal sphincter contraction, visualized during anorectal manometric recording. These patients were also shown a normal tracing to demonstrate the missing voluntary external sphincter/pelvic floor contraction and/or the abnormal increase in intra-abdominal pressure during attempted anal squeeze. These patients were also instructed to make a normal voluntary contraction of the voluntary anal sphincter (varying muscles in the anal area which surround the anal canal, such as the muscles of the pelvic floor and nearby gluteal muscles) in an attempt to reproduce contractions (or tracings) without intra-abdominal pressure increase, approximate to the normal external sphincter contractions that they had been shown previously. Constant verbal reinforcement was given when correct responses were made, and the patient was encouraged to try harder or to modify his or her efforts in order to produce tracings similar to normal tracings. In addition, rectal balloon distention volumes large enough to be felt by the patient were used, together with visual and verbal feedback, in an effort to train the patient to recognize smaller distention volumes and to synchronize voluntary anal sphincter contraction with balloon distention. The patient was encouraged to increase the amplitude and duration of the voluntary anal sphincter response. Later on the visual and then the verbal feedback was withdrawn. Each biofeedback training session lasted 60 to 90 minutes.

The biofeedback patients were instructed to practice the learned techniques at home. They were given a biofeedback device and asked to practice with it for 20 to 30 minutes at least every other day until one week after the third biofeedback training session. For home biofeedback training the patient placed a $2 \cdot 5 \times 3$cm balloon into the anal canal, connected it via small and large water-filled tubing to an upright water-filled measuring device, which was graded, and then filled the tubing and anal balloon with water. By varying the height of placement of the water-filled measuring device, the differences in anal sphincter tone and strength of each study patient could be taken into account.

Measurement

The subjective measurement of continence was obtained from the stool recordings and the pretreatment and follow-up questionnaires. The frequency of soiling episodes per week was calculated. A good response to treatment was defined as the disappearance of soiling or more than 75 per cent improvement in the frequency of soiling six and 12 months after the study began (Wald 1981, 1983).

For objective measurement, anorectal manometric evaluations and saline continence tests were done once in controls and twice in patients. Patients were evaluated first on the day of randomization and second on the day of the third visit or the third biofeedback training session. For patients who received biofeedback training, the battery of anorectal tests was repeated four or more hours after the biofeedback session so that the anal muscles had time to recover from the training in the morning.

The instrument used for the anorectal manometric evaluation was a motility probe (Model P31-D3, Sandhill Scientific, Littleton, CO) (Loening-Baucke 1984*a*, *b*). This is a flexible, silicone-rubber tube (5mm in diameter) which contains three intraluminal transducers spaced 5cm apart at the distal end. A latex balloon is attached to the end of a thin polyethylene tube and tied to the tip of the motility probe, 5cm above the distal end. Pressure from the latex balloon is transmitted via the polyethylene tube to a pressure transducer (Beckman, Type 4-327-0). The output of all four transducers was fed into a Beckman R-611 dynograph recorder (SensorMedics, Anaheim, CA).

The manometric studies were performed with the children lying on their left side, with the hips and knees flexed. Anal resting tone and maximal squeeze pressure were determined during step-wise retraction of 1cm of one intraluminal pressure transducer of the motility probe from the rectum through the anal canal. Anal resting tone was defined as the pressure (mmHg) at the troughs of the waves. The highest anal resting tone was located 1 to 2cm above the anal verge. The maximum squeeze pressure (mmHg) was the highest pressure increase measured above anal resting tone. We defined a normal squeeze as a pressure increase in the anal canal without intra-abdominal pressure increase. The effect of rectal distention on anal tone was assessed with the base of the latex balloon lying 11 to 12cm above the anal verge and the pressure transducer lying in the anal canal in the area with the highest tone (1 to 2cm above the anal verge).

The thresholds of rectal sensation (ml air) and of the rectosphincteric reflex were determined two or three times by inflating the balloon transiently, for less than one second, in random order with 60, 50, 40, 30, 25, 20, 15, 10 or 5ml of air with a graduated syringe, starting each time at 0. The threshold of the rectosphincteric reflex was the smallest air volume that produced a 5mmHg or greater decrease in anal tone. The air volume when two of the three inflations were felt was defined as the threshold of rectal sensation. The critical volume was the minimal amount of air (ml) felt as a lasting urge (30 seconds) to defecate and was determined by stepwise adding of 30ml air each 20 to 30 seconds into the rectal balloon. The elasticity of the rectal wall (ml/mmHg) was calculated by dividing the critical volume with the corrected balloon pressure at the time the critical volume was reached. The balloon pressure was corrected by subtracting the pressure recorded when the balloon was inflated with the critical volume outside the rectum.

TABLE I
Characteristics of patients with myelomeningocele

	Patient no.	*Age (yrs)*	*Sex*	*Level of motor deficit*	*Level of sensory deficit*	*CNS shunt*	*Bracing*
Conventional treatment	1	21	F	L3–4	L5	No	Yes
	2	8	M	L4–5	L4–5	Yes	Yes
	3	9	M	L4–5	S1	Yes	Yes
	4	16	M	S1–2	S1–2	Yes	No
Biofeedback treatment	5	7	F	L1	L1	Yes	Yes
	6	12	M	L3–4	L3–4	Yes	Yes
	7	10	M	L5	L5	Yes	Yes
	8	12	F	L5	L5	Yes	Yes
	9	8	M	S1	S1	Yes	No
	10	15	M	S1	S1	No	No
	11	21	M	S1–2	S3	Yes	No
	12	9	F	S2–3	S2–3	Yes	No

TABLE II
Soiling frequency before and after treatment

		Before study		*12 months later*	
	Patient no.	*Management*	*Soiling frequency/ week*	*Management*	*Soiling**
Conventional treatment	1	Diphenoxylate hydrochloride 1-2 tabl/d	2	Activated charcoal 2 caps/d	50% improved
	2	Bisacodyl supp 1/2d	12	Bisacodyl supp 1/d	98% improved
	3	Sennoside B 1 tsp/d, digital elimination 1/d	3	Sennoside B 1 tsp/d, digital elimination 1/wk	96% improved
	4	None	5	None	90% improved
Biofeedback treatment	5	None	1	None	50% improved
	6	Sennoside B 2 tabl/wk	24	Sennoside B 1 tabl/3d	87% improved
	7	Sennoside B 2 tabl/wk	7	Sennoside B 1 tabl/d	79% improved
	8	None	18	Sennoside B 3 tabl/d	No change†
	9	None	14	None	50% improved
	10	Digital elimination 1/d	2	None	50% improved
	11	Methyl cellulose 2 tbs/d	7	None	Resolved
	12	Sennoside B 2 tsp/wk, digital elimination 1/d	2	Sennoside B 2 tsp/wk, digital elimination 1/d	No change‡

*Calculated by frequency of soiling episodes for two months before study and during months 11 and 12 of study.
†Lack of motivation.
‡Returned to daily digital elimination, sennoside B, and two soiling episodes/week.

Balloon defecation

To stimulate defecation of a stool from the rectum, patients and controls were asked to defecate rectal balloons filled with 30, 50 and 100ml water, allowing five minutes for each balloon, while sitting on a toilet chair. Balloon defecation was counted as normal if any two or all three balloons could be defecated (Loening-Baucke and Cruikshank 1986).

Saline continence

For objective measurement of continence the saline continence test was done immediately after the manometric evaluation (Haynes and Read 1982). A small catheter was inserted into the rectum, with its tip positioned 10cm from the anal verge. Saline maintained at 37°C was infused into the rectum at a rate of 60ml/minute up to 240ml, while the patient sat upright in a specially designed chair with a central round aperture. If no leakage occurred, the patient was instructed to retain the 240ml saline for five minutes. Any leakage was collected by means of a funnel and a collecting cylinder which sat on top of a weight transducer. The signal from the weight transducer was fed into the dynograph recorder. The volume infused into the rectum when leakage of ≥10ml saline first occurred was measured.

Statistical analysis

Statistical methods used included the Wilcoxon non-paired rank sum test and signed rank sum test, Student t test for paired data, and Fisher exact test.

Results

All patients with fecal incontinence could feel rectal balloon distention with 60ml of air. Four patients were randomized to receive conventional treatment only and eight patients to receive biofeedback therapy. Their details are given in Table I. One patient in the conventional treatment group and three patients in the biofeedback group were mildly mentally retarded. All but two patients had a normally formed stool in a normal-sized rectal ampulla. The other two patients' rectums were empty; one had a huge rectum, the other a normal-sized rectum. Patient 4 had release of a tethered cord during the study period, and patient 9 had shunt breakage and replacement between the second and third biofeedback training sessions.

Subjective measurements: soiling frequency and outcome

Before treatment, some patients in both treatment groups used laxatives, suppositories and digital elimination to improve stool incontinence (Table II). Four patients did not use medication. One used diphenoxylate hydrochloride to control intermittent diarrhea. Mean soiling frequency per week was not significantly different between the conventional group ($5 \cdot 5 \pm 4 \cdot 5$) and the biofeedback group ($9 \cdot 4 \pm 8 \cdot 5$) ($p > 0 \cdot 6$) (Fig. 1).

At the six-month evaluation the treatments were the same as at 12 months (see Table II). Soiling frequency per week had decreased to $1 \cdot 3 \pm 1 \cdot 3$ in the conventional group and to $4 \cdot 9 \pm 5 \cdot 2$ in the biofeedback group. There was no significant difference in soiling frequency between the conventional and biofeedback groups, nor between the initial and six-month soiling frequency of each treatment group ($p > 0 \cdot 09$). A good treatment response was observed in two of the four conventionally treated patients, and in four of the eight biofeedback-treated patients ($p = 1$).

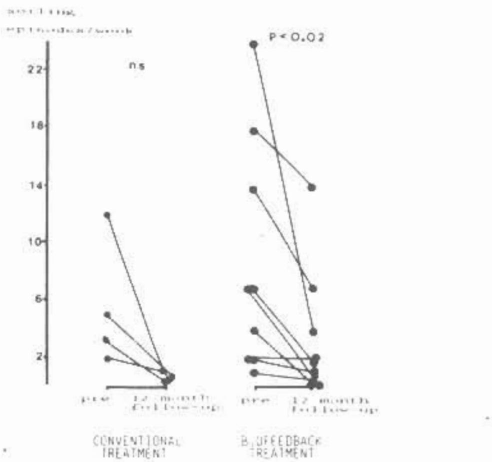

Fig. 1. Number of soiling episodes before and 12 months after initial evaluation. A good response (≥75 per cent decrease in frequency of soiling) was accomplished by three of four patients in conventional group and by three of eight patients in biofeedback group.

The medical interventions at 12 months in the conventional and biofeedback groups are shown in Table II. The soiling frequency per week had decreased to $0 \cdot 5 \pm 0 \cdot 4$ in the conventional group and to $3 \cdot 6 \pm 4 \cdot 7$ in the biofeedback group (see Fig. 1). Soiling frequency per week was significantly reduced from the pre-treatment frequency in the biofeedback group ($p < 0 \cdot 02$), and was also reduced, but not significantly so, in the conventional group ($p > 0 \cdot 1$). Treatment outcome was similar in both treatment groups; three of four patients in the conventional group and three of eight patients in the biofeedback group had a good clinical response ($p > 0 \cdot 5$).

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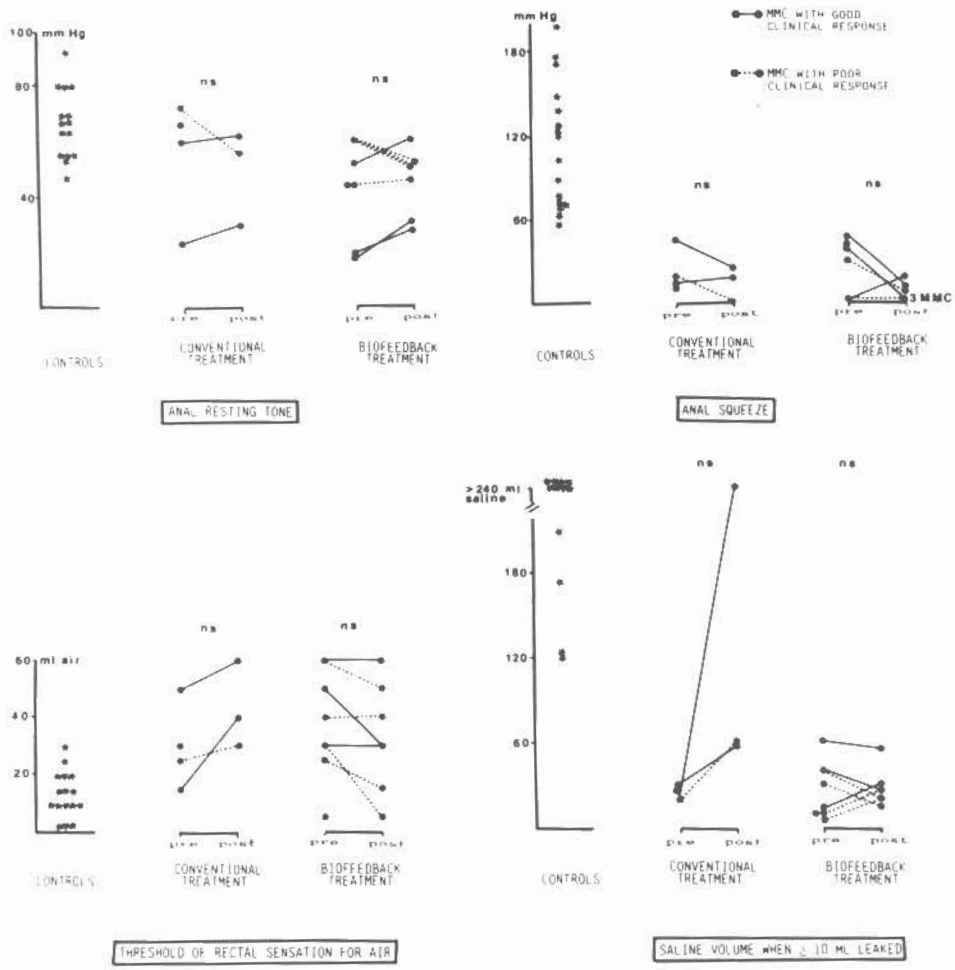

Fig. 2. Anal resting tone, anal squeeze pressure, threshold of rectal sensation for air and saline volume when ≥ 10ml saline leaked for both patient groups before treatment and 35 to 77 days later, in comparison with controls. (MMC = myelomeningocele.)

Objective measurements: anorectal measurements

The anorectal measurements for the control children and the conventional- and biofeedback-treated patients are plotted in Figure 2, and the means and standard deviations of the measurements are given in Table III. The means of anal resting tone, maximal squeeze pressure, threshold of rectal sensation, and leak volume of saline infusion were significantly different between the patients and the controls ($p<0 \cdot 02$). The internal anal sphincter produces 75 to 85 per cent of the anal resting tone; the rest comes from the external anal sphincter (Schweiger 1979, Freckner and Euler 1975). Therefore the internal anal sphincter tone in the patients was similar to that of the controls. The maximal anal squeeze was not only significantly lower in the patients than in the controls, but only patient 4 could squeeze initially without intra-abdominal pressure increase. Five patients increased intra-abdominal pressure simultaneously with anal squeeze, two were not able to increase anal tone and four made an attempt to defecate when told to squeeze (increased intra-abdominal pressure and decreased anal tone). 15 of the 16 control children could do a normal squeeze and only one increased intra-abdominal

TABLE III
Means and standard deviations of anorectal measurements of controls and patients

	Controls (N=16)	*Patients (N=12)*	*p**
Anal resting tone (mmHg)	67±12	48±19	<0·02
Maximal squeeze pressure (mmHg)	140±52	21±19	<0·001
Rectal balloon distention (air)			
Threshold of rectosphincteric reflex (ml)	11±5	14±7	NS
Threshold of rectal sensation (ml)	14±7	35±17	<0·001
Critical volume (ml)	101±39	130±69	NS
Rectal-wall elasticity (ml/mmHg)	8±9	6±3	NS
Saline volume when ≥10ml leaked (ml)	212±47	25±16	<0·001

*Wilcoxon non-paired rank sum test.

TABLE IV
Means and standard deviations of anorectal measurements of conventional and biofeedback groups

	Conventional treatment		*Biofeedback treatment*	
	Initial (N=4)	*Follow-up (N=3)*	*Initial (N=8)*	*Follow-up (N=7)*
Anal resting tone (mmHg)	56±22	49±17	45±17	45±12
Maximal squeeze pressure (mmHg)	23±15	15±13	19±22	5±7
Rectal balloon distention (air)				
Threshold of rectosphincteric reflex (ml)	13±9	15±9	14±7	14±6
Threshold of rectal sensation (ml)	30±15	43±15	38±19	33±19
Critical volume (ml)	150±55	140±62	120±77	137±42
Rectal wall elasticity (ml/mmHg)	6±4	6±5	6±2	4±2
Saline volume when ≥10ml leaked (ml)	24±5	119±105*	26±19	27±13

*$p<0·02$ compared with follow-up evaluation of biofeedback group (Wilcoxon non-paired rank sum test).

pressure while attempting to squeeze. The voluntary squeeze of the anal canal was significantly weaker in the patients than in the controls ($p<0·001$).

The threshold of the rectosphincteric reflex, the critical volume and rectal-wall elasticity were similar in patients and controls ($p>0·2$). Balloon defecation was accomplished by 94 per cent of the controls and by 67 per cent of the patients ($p>0·1$).

Data comparing patients in the conventional and biofeedback treatment groups are given in Table IV and Figure 2. The means for anal resting tone, maximal squeeze pressure, threshold of the rectosphincteric reflex, threshold of rectal sensation, critical volume and rectal-wall elasticity were not significantly different between both treatment groups at the initial or follow-up study ($p>0·3$), nor between the initial and follow-up study for each treatment group ($p>0·2$). None of the patients learned to squeeze the anal canal with biofeedback training. The mean anal squeeze pressure in all patients was initially 19±19mmHg, and at follow-up it was 8±10mmHg ($p>0·09$). This was due not to deteriorating sphincter strength, but to inhibition of abnormal increase of intra-abdominal pressure. The anal squeeze pressure was zero before and

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after biofeedback treatment if only attempted squeezes without intra-abdominal pressure increase were evaluated.

The mean leak volumes of saline infusion were not significantly different between the initial and follow-up evaluations for each treatment group ($p>0 \cdot 3$), nor between both treatment groups during the initial evaluation ($p>0 \cdot 8$), but were significantly different between both treatment groups at the follow-up evaluation ($p<0 \cdot 02$). This significant difference was because patient 3 in the conventional group was able to retain 240ml of saline during follow-up. Patient 6 in the biofeedback group learned to defecate balloons.

Initial anal resting tone, maximal squeeze pressure, threshold of the recto-sphincteric reflex, threshold of rectal sensation, critical volume, rectal-wall elasticity, and leak volume of saline infusion were not significantly different between patients with good and poor treatment outcome ($p>0 \cdot 3$).

Patients in the biofeedback group were asked if they thought that biofeedback training was helpful, and if so in what way. Six patients thought that biofeedback training was helpful, one patient did not accept it and one patient did not think it helped. Four patients thought they had learned to recognize when they needed to go to the bathroom, while two patients reported that it made them aware of what they wanted to accomplish—a squeeze, or a defecation.

Discussion

Varying degrees of nerve impairment exist in patients with myelomeningocele, the most common being loss of anal and/or rectal sensation (Shurtleff 1980). Such patients usually are unable to differentiate sensation produced by gas from that produced by liquid or solid feces. We found a significant increase in the threshold of rectal sensation in patients with myelomeningocele compared with the controls ($p<0 \cdot 001$).

The second most common impairment in patients with myelomeningocele produces loss of function of the external anal sphincter. The sphincter cannot be squeezed voluntarily (Engel *et al.* 1974; Meunier *et al.* 1976; Cerulli *et al.* 1979; Wald 1981, 1983; Whitehead *et al.* 1981; Shepherd *et al.* 1983; Arhan *et al.* 1984). The absence of the external sphincter contraction and the reflex relaxation of the internal anal sphincter allow a rectal contraction to propel a bolus of feces or of saline through the anal canal and prevent voluntary retention. The study demonstrated a significant decrease in anal resting tone, anal squeeze pressure and leak volume of saline infusion in patients with myelomeningocele compared with the controls.

In contrast to previous studies, we randomized patients to a comparison treatment group who received no biofeedback treatment, but received the same behavior modification and follow-up attention as the biofeedback group (Engel *et al.* 1974; Cerulli *et al.* 1979; Wald 1981, 1983; Shepherd *et al.* 1983). Unfortunately the two treatment groups are unbalanced and small because we were unable to recruit more patients into the study. Still, three of eight patients in the biofeedback group and three of four in the conventional treatment group accomplished a good outcome. The frequency of soiling decreased in both groups. The decreased number of soiling episodes at 12-month follow-up in the biofeedback group was statistically significant, but this was because these patients started out with more frequent soiling episodes, but not statistically so, than the conventionally treated group.

Unlike previous reports, we did not accomplish any improvement in mean anal squeeze pressure after biofeedback training. None of our patients learned to squeeze the anal sphincter normally. Most likely this difference is related to the improved recording technique in our study. We measured anal tone and squeeze pressure with intraluminal pressure transducers inside the anal canal, while the pear-shaped balloon used by all other investigators lay halfway outside the anal canal, between the buttocks, and most likely recorded pressures which were generated below and outside the anal canal (Engel *et al.* 1974; Cerulli *et al.* 1979; Wald 1981, 1983; Shepherd *et al.* 1983).

Patients were not able to retain a significantly larger mean volume of saline without leakage after biofeedback training. We used the saline continence test as an over-all measure of susceptibility to incontinence, even though only one of our patients had intermittent diarrhea and incontinence. Patients with no or only weak sphincter function can be continent to a formed stool and we were trying to overcome problems of interpretation because of differences in stool volume and frequency produced by changes in bowel habits due to diet or medications by exposing the sphincters to a standard volume of liquid. Four of the six patients with good treatment outcome required medications to regulate stool consistency at 12-month follow-up, so the changed consistency of stool, together with defecation trials, may have been responsible for their improved continence.

Wald (1983) reported that the level of the sensory motor deficit does not predict rectal sensation thresholds. This agrees with our finding that four patients, two in each treatment group, with normal rectal sensation (mean ± 2 SD ≤28ml air) had levels of sensory deficit at L1, L5, S1 and S1. Rectal sensation has been reported to be abnormal in many neurologically normal children with chronic constipation and encopresis (Loening-Baucke 1984*a*). Most of them have a megarectum and increased rectal-wall elasticity. We did not find an increased critical volume or rectal-wall elasticity in our patients with myelomeningocele compared with the controls, so we cannot relate the abnormal rectal sensation in our patients to megarectum or level of sensory deficit.

This study was done on a subset of patients with myelomeningocele who were mobile and had no other impairing physical disabilities, representing approximately 50 per cent of patients with myelomeningocele. We found no improvement in anorectal function after three biofeedback training sessions and perineal exercises using biofeedback at least every other day. They had no better outcome than the patients treated with conventional therapy alone. Our findings agree with a recent study by Whitehead *et al.* (1986), who also found that patients given only behavioral modification therapy for three months showed as much clinical improvement as those given behavioral modification plus biofeedback.

This study suggests that previous reports, because they were not controlled for non-specific treatment effects, have overestimated the value of biofeedback for the treatment of fecal incontinence in patients with myelomeningocele, and that conventional therapy is beneficial. Regular and frequent toilet sitting, laxatives or stimulants for stool evacuation, as needed, and encouragement and frequent monitoring will improve the fecal incontinence.

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SUMMARY
This study evaluated the efficacy of biofeedback training for fecal in continence in patients with myelomeningocele. 12 patients were randomized to receive conventional treatment alone, or in conjunction with biofeedback. Anorectal manometric functions were evaluated before and after treatment, six and 12 months later. 16 control children were also studied. Three of eight patients in the biofeedback group and three of the four given conventional treatment alone reported ≥75 per cent improvement in frequency of soiling 12 months later. Biofeedback training did not improve anal squeeze, rectal sensation or continence of rectal infused saline. The number of patients who improved in both treatment groups was not different.

RÉSUMÉ
Rééducation par biofeedback chez les spina bifida avec incontinence rectale
L'étude a tenté d'apprécier l'efficacité du biofeedback dans le traitement de l'incontinence rectale chez des patients porteurs d'un myéloméningocele. 12 patients ont été distribués au hasard pour

recevoir un traitement conventionnel seul, ou en conjonction avec un biofeedback. Les fonctions manometriques anorectales furent appréciées avant et après traitement. L'incontinence fut apréciée six et 12 mois plus tard. 16 enfants contrôles furent aussi étudiés. L'incontinence s'améliora chez trois des huits sujets du groupe biofeedback et chez trois dés quatres sujets du groupe conventionnel. Biofeedback n'a pas amélioré la pression annale, la sensibilite rectale ou la retention d'un lavement de solution salée. Le number de sujets ayant bénéficé du traitement dans chaque groupe n'était pas different.

ZUSAMMENFASUNG

Biofeedbacktraining für Patienten mit Myelomeningocele und Stuhlinkontinenz
In dieser Studie wurde die Wirksamkeit eines Biofeedbacktrainings für Stuhlinkontinenz bei Patienten mit Myelomeningocele untersucht. 12 Patienten wurden nur konventionel oder in Verbindung mit dem Biofeedback behandelt. Die anorektalen Funktionen wurden vor und nach der Behandlung kontrolliert, und Kontinenz wurde sechs and 12 Monate später beurteilt. Außerdem wurden 16 Kontrollkinder untersucht. Drei von acht Patienten der Biofeedbackgruppe und drei von vier Patienten mit konventioneller Behandlung allein zeigten 12 Monate später ≥ 75 Prozent Besserung in der Häufigkeit des Einkotens. Das Biofeedbacktraining hat nicht den Sphinkterdruck, die rektale Empfindsamkeit oder die Kontinenz für rektal infundierte Salzlösung verbessert. Die Anzahl der Patienten mit Besserung des Einkotens war ähnlich in den beiden Behandlungsgruppen.

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