

# Is a New Biofeedback Therapy Effective for Fecal Incontinence in Patients Who Have Anorectal Malformations?

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**Purpose:** The authors devised computerized equipment for use in the biofeedback therapy in the management of fecal continence after surgery for anorectal malformations.

**Methods:** The therapy was used for two to eight sessions in 14 children (11 who had high-type anomalies and three who had intermediate-type anomalies). The ages ranged 5 to 14 years. A control group of 17 children, aged 5 to 11 years, who had encopresis, was also treated with the same biofeedback therapy.

**Results:** Clinical improvement was noted in 5 of the 14 (36%) children who had fecal incontinence, and in 15 of the 17 children (88%) who had encopresis. Both in patients who had fecal incontinence and in those who had encopresis, anal resting pressures were not affected by biofeedback therapy.

Furthermore, the anal resting pressure in children who had fecal incontinence was significantly lower than that in children who had encopresis. However, anorectal manometry showed that the biofeedback therapy improved voluntary sphincter function and rectal sensation in both groups.

**Conclusion:** Biofeedback therapy appears to be effective in most children who have encopresis whose sphincter function is intact, and in some children who have fecal incontinence after surgery for anorectal malformations.

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INDEX WORDS: Anorectal malformations, biofeedback, encopresis, fecal incontinence.

**F**ECAL INCONTINENCE frequently occurs after surgery for anorectal malformations.<sup>1</sup> However, it is often difficult to manage this problem, and conventional therapy such as glycerine enema or suppository is not always effective. It has been reported<sup>2-4</sup> that biofeedback therapy is a simple and safe method for treating children who have fecal incontinence. Therefore, we devised computerized equipment for biofeedback therapy so that patients could recognize more easily when to squeeze their anal sphincters when they viewed a colored monitor.

Here we report the follow-up results of using this new computer-assisted biofeedback therapy in patients who have fecal incontinence after surgery for anorectal malformations and in patients who have encopresis as a control group. The implications for using this biofeedback therapy in children are also discussed.

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## MATERIALS AND METHODS

Fourteen children (12 who had high-type anomalies and two who had intermediate-type anomalies), aged 5 to 14 years, continued to have fecal incontinence after surgery for anorectal malformations despite the use of glycerine enema or suppository. None of the 14 had deformities of the sacrum and all patients were given biofeedback therapy. Seventeen children, aged 5 to 11 years, who had encopresis also received biofeedback therapy. All 17 had received conventional medical treatment such as laxative, glycerine enema, or suppository for 2 months to 5 years. Clinical assessment of the functional results was done using the Kelly score system,<sup>5</sup> which is based on three criteria: (1) control of feces and bowel functions, (2) fecal staining, and (3) sling action of the puborectalis muscle. Each criterion is given two points, for a maximum of six points.

Manometric studies and biofeedback therapy were performed with a pressure probe that was perfused at a constant speed of 10 mL/h.<sup>6</sup> This apparatus was connected to a transducer, and signals were transferred to a personal computer (PC 9801, NEC, Tokyo, Japan) through a 12-bit analog digital converter (Analog Pro Jr, Canopus, Kobe, Japan). The pressure was then expressed on a color monitor. To attract the patient's interest during the training, four games, similar to TV games, were designed for the monitor as training programs. The patients were required to squeeze their anal sphincter as much as possible to recognize their total squeezing power. An ellipse, on the color monitor, increased in size corresponding to squeezing pressure (Fig 1A). The patients were also asked to maintain a certain anal pressure, which had been determined before training began (Fig 1B and C).

In another program for regulation of anal squeezing, the patients tried to pass various pressure gates on the monitor (Fig 1D). By these designed games, they could see how effective they were at attaining adequate anal squeezing pressures. The children were hospitalized for 1 week, and therapy was performed twice a day.

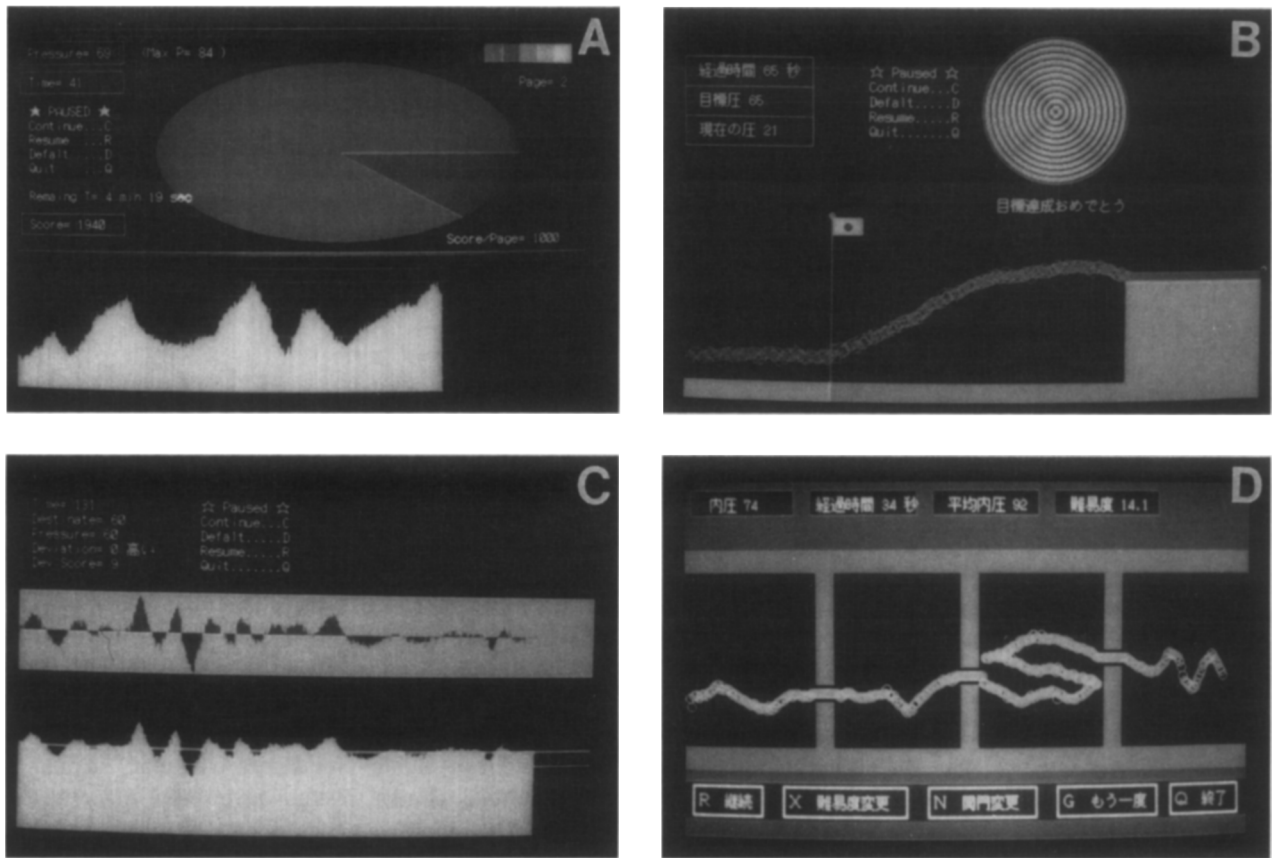


Fig 1. (A) A growing ellipse shape is drawn on the screen corresponding to voluntary squeezing pressure. (B,C) Training programs for regulation of anal squeezing. The patient makes an effort to maintain a certain pressure that was determined prior to the training. (D) The patient is required to regulate anal pressure to pass the various pressure gates.

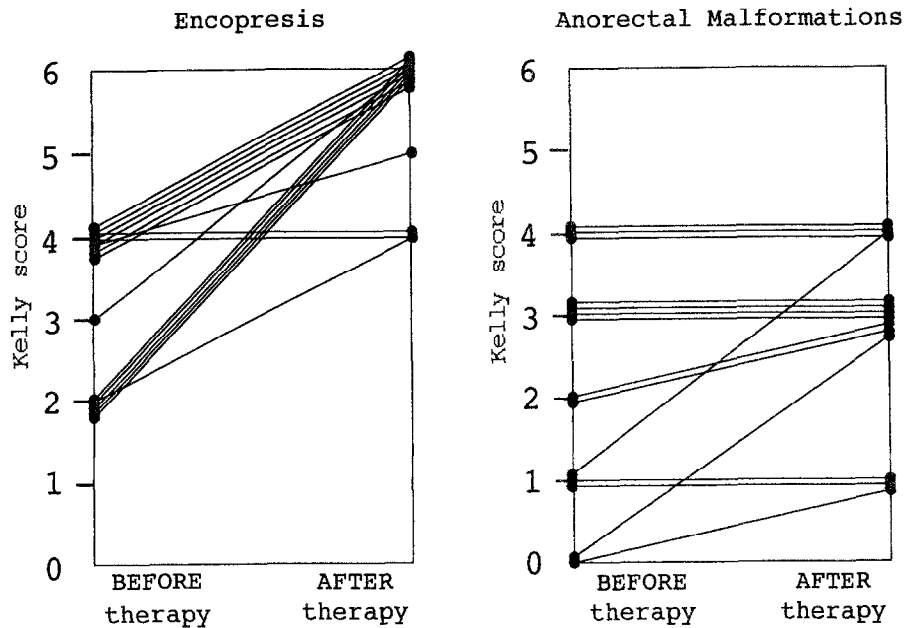


Fig 2. Kelly scores before and after biofeedback therapy. Fifteen of the 17 patients who had encopresis showed improvement in their scores after therapy. Five of the 14 patients who had fecal incontinence showed improvement after therapy.

**Table 1. Results of Anorectal Manometry Before and After Biofeedback Therapy**

		Anal Resting Pressure (cm H <sub>2</sub> O)	Presence of Anorectal Reflex	Voluntary Contraction Pressure (cm H <sub>2</sub> O)	Voluntary Contraction Time (sec)	Threshold for Rectal Sensation (mL)	Maximum Tolerated Rectal Volume (mL)	Rectal Compliance (mL/cm H <sub>2</sub> O)
Anorectal malformation (n = 14)	Before	23.8 ± 3.7*	0/14	38.2 ± 7.8‡	46.4 ± 11.1*	62.7 ± 10.5†	134.2 ± 14.2	3.6 ± 0.7
	After	26.3 ± 2.4	0/14	81.1 ± 11.3‡	88.1 ± 15.9*	36.5 ± 10.3†	150.8 ± 21.0	3.5 ± 0.7
Encopresis (n = 17)	Before	53.3 ± 13.8*	17/17	78.3 ± 10.2*	63.2 ± 11.3*	60.0 ± 12.9*	148.7 ± 38.4	4.2 ± 1.1
	After	55.1 ± 14.2	17/17	108.3 ± 9.8*	102.7 ± 13.5*	30.4 ± 6.2*	145.0 ± 37.4	2.8 ± 0.7

\**P* < .05†.05 < *P* < .1‡*P* < .01

Statistical analysis of the data was done by Student's *t* test, and all values were presented as mean ± SE.

## RESULTS

Five of the 14 children (36%) who had fecal incontinence showed improvement in their Kelly scores, and the remaining nine patients showed no improvement after two to eight training sessions (Fig 2). Fifteen of the 17 children (88%) who had encopresis showed improvement in their scores after two to three sessions of training. Eleven of the 17 children who had encopresis achieved the maximum 6-point score after biofeedback therapy. In the 14 patients who had fecal incontinence, anal resting pressures were not affected by biofeedback therapy (Table 1). The anal resting pressure before therapy was significantly lower than that of the encopresis patients, and the anorectal reflex was not present in any of the 14 children. Voluntary contraction pressure and contraction time increased significantly (*P* < .05, *P* < .01), and the threshold for rectal sensation decreased (.05 < *P* < .1) after therapy. In the 17 patients who had encopresis, anal resting pressure was also not affected by biofeedback therapy, but these patients had adequate anal resting pressure (53.3 ± 13.8 cm H<sub>2</sub>O) before the therapy began. In addition, the anorectal reflex was present in all 17 children. Voluntary contraction pressure and contraction time increased significantly (*P* < .05), and the threshold for rectal sensation decreased significantly (*P* < .05) after therapy.

## DISCUSSION

Manometric studies before and after biofeedback therapy showed different results between children who

had fecal incontinence after surgery for anorectal malformations and those who had encopresis. The children who had fecal incontinence neither sustained adequate anal resting pressure nor showed an anorectal reflex, but children who had encopresis exhibited normal pressures and reflex. These results showed that involuntary sphincter function was restored in children who had encopresis but not in those who had fecal incontinence. However, the children who had anorectal malformations had congenitally absent<sup>7</sup> or weak<sup>8</sup> internal sphincter muscle.

Biofeedback therapy reinforced voluntary sphincter function, and similar results have been reported by Rintala et al.<sup>3</sup> Improved conditioning of rectal sensation is also an important factor in biofeedback therapy, and in this study the therapy was shown to be effective in this regard. Patients who have encopresis, who have normal functioning in the internal sphincter, can acquire normal bowel control if biofeedback therapy corrects abnormal defecation dynamics,<sup>9,10</sup> and normal sensation of the rectum can be achieved. However, in patients who have fecal incontinence, the internal sphincter, which is most important for maintaining anal resting pressure, is congenitally absent or weak. Therefore, adequate anal continence can not be achieved even if the function of the external sphincter or rectal sensation is improved by biofeedback therapy. These results indicate that our biofeedback therapy can be effective in children who have encopresis or in children who have fecal incontinence if adequate anal resting pressure is preserved after an appropriate pull-through operation. However, biofeedback therapy is not effective in children who have fecal incontinence whose anal resting pressure is not adequately preserved before the therapy.

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