

# Use of biofeedback (BFB) in the treatment of fecal incontinence after surgical correction of anorectal malformations by posterior sagittal anorectoplasty (PSARP)

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**Objective:** To evaluate biofeedback(BFB)responses to rehabilitation techniques and physical exercises in incontinent or partially continent anorectal malformations patients after posterior sagittal anorectoplasty (PSARP). **Design:** Prospective study. **Setting:** Pediatric Surgery - Department of Surgery - UNIFESP-EPM. **Patients:** The authors report on 14 patients with anorectal malformations (4 with partial fecal incontinence after primary PSARP; 6 with fecal incontinence after primary PSARP; 3 with partial fecal incontinence after secondary PSARP; and 1 with fecal incontinence after secondary PSARP). All patients were rehabilitated via a BFB program of exercises in order to improve the function of the anal sphincteric muscular complex for a period of 1-3 years. **Main outcome measure:** Clinical and manometric control. **Results:** After BFB, of 4 partially continent patients after primary PSARP, 3 became continent; of 6 incontinent patients after primary PSARP, 4 became continent; of 3 partially continent patients after secondary PSARP, 1 became continent, 1 showed no improvement and 1 became incontinent (infection + abscess + fibrosis + important anorectal stenosis). The incontinent patient after secondary PSARP showed no improvement. **Conclusion:** The authors concluded that BFB, used at the appropriate time with patient collaboration, is an important complement to the anatomical reconstruction of anorectal malformations in order to achieve good development and contractile functioning of the sphincteric muscular complex.

**UNITERMS:** Anorectal malformations. Biofeedback. Fecal incontinence

## INTRODUCTION

Since Peña and De Vries<sup>1</sup> study in 1982, PSARP has been the preferred surgical technique of the majority of pediatric surgeons worldwide to correct anorectal malformations(AM). However, even with the good surgical results obtained with this technique, some patients, especially those with coexisting sacral malformations, remain partially or totally fecal incontinent.

For these patients, especially those without the possibility of another PSARP-type surgery for secondary incontinence, the use of biofeedback-type rehabilitation may result in clinical improvement. Biofeedback (BFB) is a functional rehabilitation program realized with the aid of monitors or devices, whose readings are made known to patients in hopes of sparking their interest in improving these readings, and thus inducing better clinical results and manometric scores.

BFB was used in the treatment of postoperative fecal incontinence by Olness et al.<sup>3</sup> in patients operated for AM, using balloon devices connected to pressure transducers and an oscilloscopy. Constantinides and Cywes<sup>4</sup> also used the balloon devices in the postoperative training of incontinent patients after AM surgical correction. Others<sup>5,6,11</sup> have used different BFB schedules to improve surgical results.

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We decided to use BFB in patients operated by PSARP for AM who became totally or partially fecal incontinent in order to improve their quality of life.

## MATERIALS AND METHODS

Table 1 shows 14 incontinent patients, 10 after primary PSARP surgical correction, and 4 after secondary surgical correction of AM. All patients had high AM.

Of 14 patients, 11 had associated sacral malformations (Table 2).

We considered continent patients those who had 1-2 bowel movements/day, with feces normal in aspect and consistency, and without episodic escapes or soiling, whose anus was normal and clean upon clinical inspection. Under digital exam, they presented good contraction at the

superior and inferior part of the muscular sphincteric anorectal complex.

Partially continent were those who had 3-5 bowel movements/day, with pasty feces, frequent escapes of feces and soiling, and whose anus was regular and dirty, with areas of mucous prolapse. Under digital exam they had regular contraction at the superior or inferior part of the muscular sphincteric anorectal complex.

Incontinent patients were classified as those with 5 or more bowel movements/day, with continuous and total loss of liquid feces. The anus was abnormal, totally opened or with a great degree of mucous prolapse, with visible fecal loss. Under digital exam, they presented weak or absent contraction of the superior and inferior part of the muscular sphincteric anorectal complex.<sup>5</sup>

We submitted patients older than 4-years who possessed the necessary personal maturity and family collaboration to BFB. A defecogram and anorectal manometric evaluation were undertaken, the manometric evaluation by measuring the following: rest sphincteric anal pressure (RP); recto-sphincteric reflex (RSR); pressure response to cough (C), voluntary contraction (VC) and perianal stimulation (PAS); duration of voluntary contraction (TVC); and simple (SPC) and potentialized pressure curves (PPC) of the anorectal canal.<sup>6</sup>

Patient and family were informed of the radiological findings and manometric scores. Patients then received instructions for physical exercises to strengthen the muscles of the anorectal sphincteric complex. These exercises were coughing, doing voluntary contractions, sustaining voluntary contractions, and other general exercises designed to improve the force of the gluteus and antero-lateral abdominal wall.

The most important thing was to inform the patient and family about his scores in order to promote the collaboration required to improve results each time readings were taken. Parents could assist in the prescribed exercises by instructing their child not to contract the gluteus muscle but preferentially the anorectal muscular sphincteric complex, which requires attention throughout the physiotherapy session. Parents had previously received the necessary orientation on the anatomy and function of the anorectal region.

To undertake the BFB, we used a special balloon device developed by the Pediatric Surgery Manometry Laboratory of UNIFESP-EPM.<sup>7</sup> After daily training at home, patients were evaluated every 3 months in this laboratory in order to control functional and clinical development. The first and last manometric control readings are shown in Table 3.

**Table 1**  
Clinical data of patients submitted to BFB (n=14)

Sex:	
Male	13
Female	1
Age (in years)	5 to 19 (medium = 10)
BFB duration (in years)	1 to 3
Surgery:	Primary PSARP: 10 Secondary PSARP: 4

**Table 2**  
Associated sacral malformations (n = 14)

Type of sacral malformation	Number (%)
No malformation	3 (21.42 %)
Absent coccyx	1 (7.14 %)
Absent coccyx, S5	3 (21.42 %)
Absent coccyx, S5, and others	2 (14.28 %)
Absent coccyx, S5 and fusion of upper sacral vertebrae	4 (28.57 %)
Others	1 (7.14 %)

**Table 3**  
Anorectal manometry evaluation pre- and post-BFB

N	RP		Cough		V.C.		TVC		PAE	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
1	9	11	15	20	13	25	5	10	11	15
2	10	12	12	22	18	20	7	9	10	13
3	12	15	19	30	19	35	0	7	16	17
4	12	13	18	18	20	21	8	11	14	14
5	5	11	8	25	8	15	8	8	7	11
6	5	10	7	11	10	16	6	6	7	13
7	5	6	7	7	7	15	3	7	6	7
8	6	9	7	10	10	15	6	8	6	11
9	4	8	6	10	6	8	0	9	5	9
10	7	10	11	18	11	21	0	3	8	9
11	5	10	18	19	15	24	6	10	6	12
12	1	18	20	20	24	31	9	9	18	19
13	7	8	9	24	18	31	47	22	10	12
14	4	6	5	8	5	8	0	3	5	6

Patients 1-4 = Partial continence after primary PSARP.  
 Patients 5-10 = Fecal incontinence after primary PSARP.  
 Patients 11-13 = Partial continence after secondary PSARP.  
 Patient 14 = Incontinent patient after secondary PSARP.

**Table 4**  
Pressure curve pre- and post-BFB

N	Simple Pressure Curve				Potentialized Pressure Curve					
	Pre-BFB		Post-BFB		Pre-BFB			Post-BFB		
	Aspect	Level	Aspect	Level	Aspect	Level	Cont	Aspect	Level	Cont
1	n	1	n	n	n	1	-	n	n	++++
2	n	1	n	n	n	1	+	n	n	+++
3	n	1	n	n	n	1	++	n	n	+++
4	n	1	n	n	n	1	+++	n	1	+++
5	n	1	n	1	n	1	-	n	l	++
6	a	1	n	1	a	1	++	n	1	+++
7	a	hf	a	hf	a	hf	-	a	h	f-
8	a	l	a	l	a	l	-	a	l	++
9	a	hf	a	hf	a	hf	+	a	hf	++
10	a	hf	a	hf	a	hf	-	a	hf	+
11	n	l	n	l	n	l	+++	n	l	+++
12	a	hf	a	hf	a	hf	-	a	hf	+
13	n	l	n	l	n	l	++	n	l	++
14	a	hf	a	hf	a	hf	+	a	hf	++

n = normal; a = abnormal; l = low; hf = high with fibrosis

We observed that the simple and potentialized pressure curves of the anal canal in Group 1 normalized after BFB, and the number of contractions in 3 of 4 patients increased. In Groups 2, 3 and 4, however, no changes in the aspect or level of the curves were observed, but the number of contractions in these groups also increased.

Fibrosis results in a curve with high pressure values and short duration caused by the tissue fibrosis, sometimes with local stenosis and few contractions in the potentialized curve.

In our patients with high AM (absent external sphincter), we did not observe the recto-sphincteric reflex pre- or post-BFB.<sup>8</sup>

We used BFB in 14 patients after PSARP for anorectal malformations, divided into the following 4 groups:

1. Four partially continent patients after PSARP used as primary surgery for treatment of AM.
2. Six incontinent patients after PSARP used as primary surgery for treatment of AM.
3. Three partially continent patients after PSARP used as a secondary surgery for treatment of fecal incontinence.
4. One incontinent patient after PSARP used as secondary surgery for fecal incontinence treatment.

In Group 1, of 4 partially-continent patients, 3 became continent after BFB, and one remained partially continent.

Of the 6 incontinent patients in Group 2, 4 became partially continent after BFB, and two showed no improvement.

Of the three partially-continent patients in Group 3, whose PSARP was a secondary surgery, 1 achieved fecal continence, one showed no improvement, and the last evolved fecal incontinence. This last case developed one important abscess in the anorectal region, with fibrosis and stenosis that contributed to the fecal incontinence, with weak manometric responses showing weak activity of the muscular sphincteric complex. In addition, the patient had a behavioral disturbance which could have impaired treatment.

We observed that contractions increased in number in the potentialized pressure curve, with clinical improvement in patients of all groups, even in the Group 4 incontinent patient, who had undergone two prior operative procedures in another hospital.

We can see the continence status after BFB in Table 5.

**Table 5**  
**Continence status after BFB**

N	Fecal Continence	
	Pre - BFB	Post-BFB
1	PC	C
2	PC	C
3	PC	C
4	PC	PC
5	FI	PC
6	FI	PC
7	FI	FI
8	FI	PC
9	FI	FI
10	FI	PC
11	PC	PC
12	PC	FI
13	PC	C
14	FI	FI

M = Male; F = Female; Y = Year; PR = Primary PSARP; SC = Secondary PSARP;

C = Continent; PC = Partial Continence; FI = Fecal Incontinence

## DISCUSSION

Many complications may arise after the treatment of AM. These depend on the surgical technique employed, the experience of the surgeon, and especially on the presence of associated sacral malformations. Therefore, a meticulous follow-up in every case is crucial.<sup>8</sup>

The worst complication is fecal incontinence. Olness et al.<sup>3</sup> used BFB in 50 children with fecal incontinence (10 operated for AM), who had all received conventional treatment without clinical improvement. The BFB was undertaken with balloon devices connected to pressure transducers and to an oscilloscopy, with the rectal balloon positioned in the rectal ampulla and two others in the sphincteric region, to research the recto-sphincteric reflex and voluntary sphincteric muscular responses.

In patients without recto-sphincteric reflex, they attempted to improve responses of the child's anal, gluteus and thighs muscles. Of 10 patients, 8 developed the possibility of voluntary defecation; 6 had normal bowel movements within a few weeks. Constantinides and Cywes<sup>4</sup> used a simple two-balloon (rectal and sphincteric) device in the postoperative training of patients submitted to surgical correction of AM in order to achieve fecal continence, with the sphincteric balloon connected in Y

to a pressure manometer. They hoped to improve puborectal contraction and anorectal continence with changes in Hg manometer.

Gil-Vernet Huguet et al.<sup>9,10</sup> used BFB in 35 patients operated with PSARP for AM, and in 31 cases they observed a real improvement in voluntary sphincteric contraction. Gonzales Vasquez<sup>11</sup> used a sphincteric training device, the Erotithan sphincter trainer, with a system of balloons, in order to measure the maximal sphincteric contraction pressure of the external sphincter, contraction duration, and the anorectal sensibility to distention of the rectal balloon in incontinent patients following AM surgical correction. They improved results with BFB, but with the presence of encopresis.

The following conditions are necessary to achieve good results with BFB:

1. A responsive recto-sphincteric muscular complex.
2. Positive anorectal sensibility.
3. Intelligence, normal psychological profile, and adequate control of the central nervous system.
4. Good doctor/patient relationship.
5. Parental cooperation.
6. Age greater than 4 years.

#### 7. Long-term treatment.

Clinical and manometric improvement are slow, and thus it is important to remember the following six commandments of chronic treatment:

1. Provide correct, personal and professional treatment.
2. Establish mutual confidence through good communication.
3. Individualize treatment, as each child is unique.
4. Discuss the patient's condition with the family, and help them to understand different treatment options
5. Coordinate orientation with assistance.
6. Provide continuous treatment and care in order to give stability and hope to the patient and family.

Treatment results should be personalized, as it is impossible to make collective and statistical conclusions, given that every patient is unique and we had a small sample size.

In conclusion, the use of BFB at an appropriate age, with patient cooperation, can be an excellent aid to the anatomical reconstruction of AM to achieve the desired fecal continence.

## RESUMO

A anorretoplastia sagital posterior (ARPSP) representa hoje, a técnica mais usada para tratamento das anomalias anorretais em todo o mundo. Entretanto, alguns casos associados com anomalias sacrais, evoluem com continência fecal parcial ou com incontinência fecal. Podemos tratar esses casos com nova cirurgia ou com técnicas de reabilitação tipo biofeedback, por meio de exercícios físicos, com a finalidade de melhorar a função do complexo muscular esfinteriano. São relatados 14 casos de pacientes portadores de anomalias anorretais (4 com continência fecal parcial após ARPSP primária; 6 com incontinência fecal pós ARPSP primária; 3 com continência fecal parcial após ARPSP secundária; e, 1 com incontinência fecal pós ARPSP secundária). Todos os pacientes foram submetidos a exercícios de reabilitação com a finalidade de melhorar a função do complexo muscular esfinteriano tipo BFB, durante um período de tempo que variou de 1 a 3 anos, com acompanhamento clínico e manométrico. Após o BFB, dos 4 pacientes com continência fecal parcial após ARPSP primária, 3 ficaram continentemente; dos 6 incontinentes após ARPSP primária, 4 ficaram continentemente; dos 3 pacientes com continência parcial após ARPSP secundária, 1 tornou-se continente e 1 incontinente, piorando seu resultado por infecção, abscesso, fibrose e importante estenose anal. Os autores referem que o BFB usado no momento adequado, com a colaboração do paciente, é um importante complemento para a reconstrução anatômica das anomalias anorretais, para conseguir um bom desenvolvimento e uma boa função contrátil do complexo muscular esfinteriano.

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