

Clinical and manometric postoperative evaluation of posterior sagittal anorectoplasty (PSARP) in patients with upper and intermediate anorectal malformations

Federal University of São Paulo - PSM - São Paulo, Brazil

PSARP is currently the most widely-used surgical technique for surgical correction of high and intermediary anorectal malformations, but there is much controversy in the literature about the postoperative evaluation of these cases. We studied 27 cases of anorectal malformations operated with PSARP from clinical and manometric aspects in order to analyze: 1) fecal continence; 2) the relationship between fecal continence and the associated sacral anomalies and; 3) the relationship between the postoperative manometric evaluation and fecal continence. From the analysis of 27 cases of high and intermediary anorectal malformations, we concluded that: 1) fecal continence was achieved in 48.14 percent of the cases; partial fecal continence in 25.92 percent; and fecal incontinence in 25.92 percent of the cases; 2) the presence of fecal incontinence was directly related to the association of sacral anomalies and; 3) anorectal manometry is a useful test to evaluate the patients operated by PSARP, due to the existence of a relationship between the manometric results and the degree of fecal continence.

UNITERMS: Anorectal malformations, Posterior sagittal anorectoplasty.

INTRODUCTION

Anorectal malformations (ARMs) still present a great challenge to the pediatric surgeon. Since the studies of Peña and De Vries,¹ posterior sagittal anorectoplasty (PSARP), has become the main treatment for upper and intermediate ARMs in most pediatric centers around the world. These authors also highlighted the importance of sacral malformations by stating that sacral and ARMs together lead to less favorable postoperative results.

Postoperative evaluation of patients with ARMs is very controversial. Therefore, we evaluated clinical and manometric results of 27 children with upper and intermediate ARMs who underwent PSARP.

Address for correspondence:

José Luiz Martins
Rua dos Otonis, 131 - V. Clementino
São Paulo/SP - Brasil - CEP 04025-000

PATIENTS

We studied 27 white children with 21 upper and 6 intermediate ARMs, of which 17 were male and 10 were female, and all of whom presented fistulas (17 urethral, 5 vaginal, 5 vestibular). Ages varied from 4 to 11 years.

These patients underwent colostomies with 2 openings prior to PSARP, anal dilations with Hegar's candles during the postoperative period, and the closing of the colostomies. We assessed these patients clinically and with anorectal electromanometry in order to evaluate fecal continence, relations between fecal continence and any associated sacral malformations, and relations between fecal continence and electromanometry.

Anorectal manometry was performed with rectal and sphincter balloons.² We connected the balloons to pressure transducers (Dixtal) in turn connected to a MP-100 amplifier, a video monitor, and a 3-channel register, all of which were functionally constructed and modified to assess anorectal pressure.^{3,4} All exams were done without

sedation; register sensitivity was calibrated at N = 10 mm/mv with a speed of 1mm/sec.

Manometric assay was done by following these steps:

1. Initial resting pressure measurement (in mmHg).
2. Study of sphincter-rectal reflexes by filling rectal balloon and observing the pressure response in the sphincter balloon. Reflexes were considered present when a clear pressure decrease in the sphincter balloon was observed, and considered absent when this was not observed.

3. The pressure response of the sphincter balloon during coughing was measured (in mmHg).

4. The pressure response of the sphincter balloon during voluntary sphincter contraction was measured (in mmHg).

5. The time of sustained voluntary contraction was measured (in seconds).

6. The pressure response to stimulation of perianal skin with a needle was measured (in mmHg).

7. The pressure response to patient's crying was measured (in mmHg).

8. The anal pressure was registered after the introduction of sphincter balloon into the upper rectum and constant withdrawal at 1 cm every 5 seconds (simple pressure curve).

9. The anal pressure curb was registered during withdrawal of sphincter balloon while patient was either coughing, crying, or voluntarily contracting the anus (stimulated pressure curve).⁵

Based upon these findings, the children were classified into the following three groups:

1. Continent - those who defecated once or twice a day, with no soiling, no fecal or anal alterations, and with good upper and lower rectal contraction during examination.

2. Partially continent - those who defecated three to five times a day, with normal feces and frequent soiling, who presented rectal prolapse, and with moderate upper or lower contraction during rectal examination.

3. Incontinent - children who defecated more than five times a day, with liquid feces and a constant and total fecal loss, an anus with a large opening, rectal prolapse, and a visible loss of feces and who presented light or no upper or lower contraction during examination.

Statistical analysis was done with chi-squared tests for 2XN tables to compare the continent, partially continent, and incontinent groups according to the above-mentioned characteristics. Analyses of variance using Friedman's rank test were used to compare each patient's, initial pressures, voluntary contraction, and perianal

Table 1
Relation between fecal continence and sacral malformations

	With Sacral Malformations	Without Sacral Malformations	Total
Continent	1	12	13
Partially continent	3	4	7
Incontinent	6	1	7

stimulation, and the three groups; in case of significant differences, multiple comparison tests were also performed.⁶ We used Kruskal-Wallis' test to compare patients of all three groups in relation to pressure values, which were completed by multiple comparison tests.

RESULTS

1. Fecal continence

Thirteen of 27 cases submitted to PSARP presented fecal continence, 7 cases presented partial continence, and 7 incontinence.

2. Relation between fecal continence and sacral malformations

This relation is depicted in Table 1.

3. Relation between fecal continence and manometric assays

This relation is show in Table 2

All patients in the three groups presented an absence of the sphincter-rectal reflex.

Statistical analysis of the data showed that initial pressure, pressure after coughing, pressure after voluntary contraction, pressure after perianal stimulation, and pressure after crying were significantly higher in continent patients. There were no statistically significant differences when studying sustained contractions.

Analysis of the shapes of the normal and stimulated pressure curves showed that the percentage of normal curves in incontinent patients was significantly lower than in the other patients. Pressure levels showed much higher rates of normality in continent patients when compared to

Table 2
Relation between fecal continence and manometric evaluation

No. of Continent patients	IP*	Cough	VC*	SVC**	PS*	CRY*
13	13.92	23.25	22.85	8.75	16.42	14.2
No. of Partially continent patients	IP*	Cough	VC*	SVC**	PS*	CRY*
7	10.86	16.67	17.29	9.83	12.86	22
No. of Incontinent patients	IP*	Cough	VC*	SVC**	PS*	CRY*
7	6.57	6.67	9.86	5.5	08	10.3

IP = Initial pressure; VC = Voluntary contraction; SVC = Sustained voluntary contraction; PS = Perianal stimulation
 * = mmHg; ** = seconds

incontinent and partially continent patients. Although the frequency of contractions could not be statistically analyzed, a higher incidence of contractions in continent patients was suggested.

E.S.F.S. - A.A.R. Alta - F.R.U. - P.O. de A.R.P.S.P.

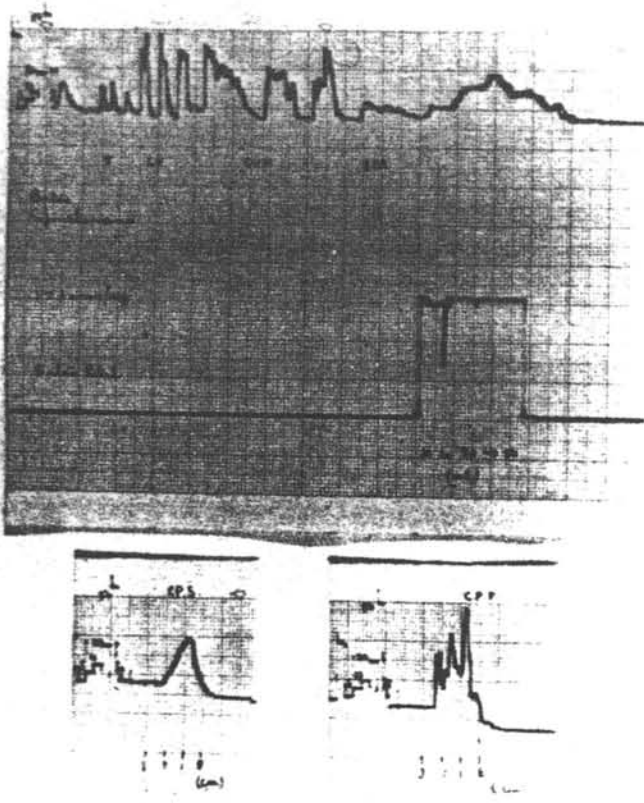


Figure 1 - Manometry of continent patient.

Figures 1, 2, and 3 show manometric readings from a continent, a partially continent, and an incontinent patient, respectively.

Schnauffer et al.⁷ demonstrated the applicability of anorectal manometry in the postoperative evaluation of anorectal malformations. Several authors⁸⁻¹⁴ have already reported anorectal manometry in this kind of evaluation.

Analysis of the initial pressure of our patients in comparison to fecal continence showed similar results to several other reports; there are pressure ranges defined for continent, partially continent, and incontinent patients, with a direct relation between initial pressure and fecal continence as mentioned by Haberkorn et al.¹⁵ and Iway et al.¹¹

Mischalany et al.¹⁶ reported during the "First International Symposium of Anorectal Manometry" that it is difficult to establish a pattern in anorectal manometry results, as many types of equipment and different methods of evaluation are used around the world. From 1987 to 1995 we used electromanometry with the balloon method on 1,153 patients,¹⁷ and since 1995 we have been using computerized anorectal manometry.¹⁸

The absence of the sphincter-rectal reflex among our patients was expected, as they presented upper or intermediate anorectal malformations in which there is either a low-functioning or absent sphincter. Even among lower malformations, in which internal sphincter fibers are rudimentary,¹⁹ the reflex is present in only 70 percent of the cases.²⁰

Pressures obtained with coughing, voluntary contraction, crying, perianal stimulation, and the time of sustained contraction allowed us to evaluate striated muscles of the sphincter complex.

Table 3
Relation between fecal continence and manometric evaluation of simple (SPC) and stimulated (StPC) pressure curves

N	Fecal Cont.	SPC		StPC		Ctrc.
		Shape	PL	Shape	PL	
1	C	A	L	A	L	F
2	C	N	N	N	N	F
5	C	N	N	N	N	F
8	C	N	N	N	F	F
12	C	N	N	N	N	F
14	C	N	L	N	L	S
17	C	N	N	N	N	F
18	C	N	N	N	N	F
21	C	N	N	N	N	F
22	C	N	N	N	N	F
25	C	N	N	N	N	F
27	C	N	N	N	N	F
7	P	N	L	N	L	
9	P	N	L	N	L	
10	P	N	N	N	N	F
16	P	N	N	N	N	F
20	P	N	L	N	L	S
23	P	N	L	N	L	S
24	P	N	L	N	L	F
3	I	A	L	A	L	
4	I	A	L	A	L	
6	I	A	L	A	L	
11	I	N	L	N	L	S
13	I	A	L	A	L	S
15	I	N	L	N	L	S
19	I	A	L	A	L	S

C = Continent; P = Partially continent; I = Incontinent

SPC = Simple pressure curve; StPC = Stimulated pressure curve; PL = Pressure level; Ctrc = Contractions

A = Abnormal; N = Normal; L = Low; F = Frequent; S = Seldom

Pressures upon coughing give us an idea of the reflexive resistance of the upper part of the anorectal sphincter complex to a sudden rise in abdominal pressure. According to Scharli and Kiesewetter,²¹ the receptors that trigger reflex contractions may be situated in the puborectal muscle.

Pressure during voluntary contraction is of major importance in manometric evaluation, since it reflects the

patient's capacity to halt defecation with the action of the striated muscles of the sphincter complex, by the closing the lower rectum using the external sphincter, and by elevating and tightening the upper rectum using the puborectal muscle.

Perianal stimulation triggers the contraction of striated muscles according to the degree of stimulation, integrity of the muscle, and innervation. Continence is better in patients with a good response to this stimulation.¹⁴

Pressures after crying allow good sphincter evaluation in small children due to wave contractions that are triggered by tightening reflexes.

Some comments should be made regarding pressure curves. Ahran et al.⁹ started using pressure curves to evaluate the extension and pressure of the anal canal in operated anorectal malformations, publishing their study in 1976.¹⁰ Gil-Vernet et al.²² highlighted the importance of pressure profiles done with progressive withdrawal of catheters from the rectum to the anus at a constant speed, obtaining a pressure curve used to evaluate the treatment of fecal incontinence in children who underwent surgical correction of anorectal malformations.

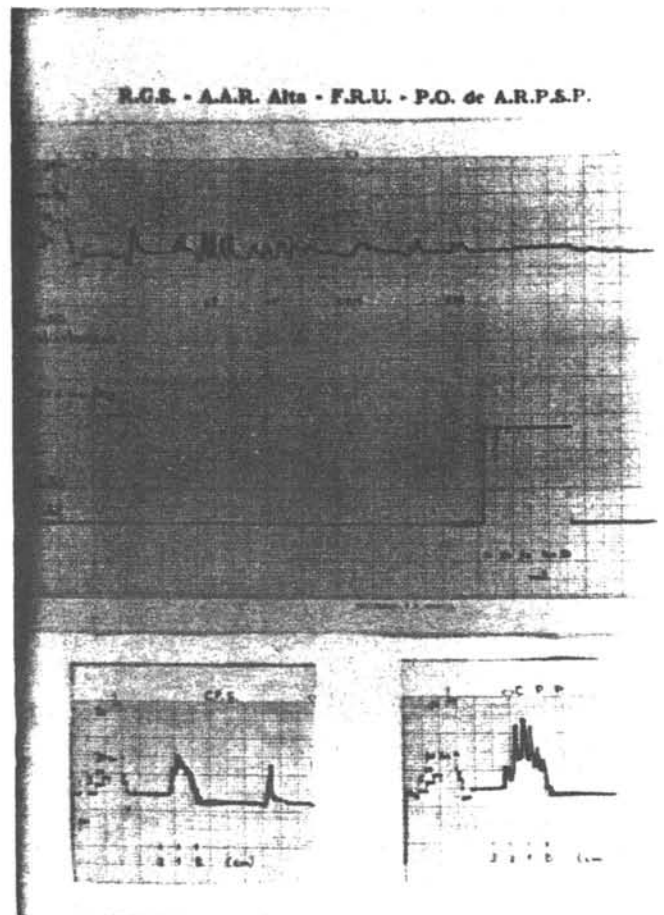


Figure 2 - Manometry of partially continent patient.

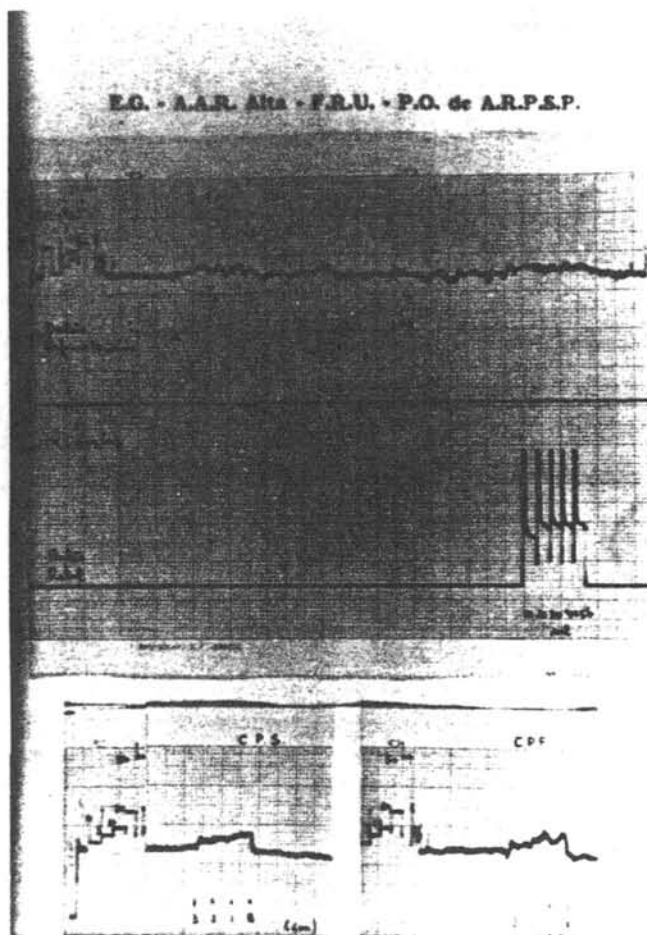


Figure 3 - Manometry of incontinent patient.

The initial part of the simple pressure curves show the repercussion of the anal levator muscle, especially of the puborectal portion; the distal portion shows the pressure in the external sphincter of the anus. A stimulated curve is

obtained by asking the patient to cough or to contract the anus voluntarily; moreover, this can also be obtained during crying. Total or partial contractions observed in the curve during withdrawal of the catheter at constant speed demonstrate which regions are capable of contracting.

PSARP is used throughout the world for primary treatment of upper and intermediate ARMs. However, it is a difficult technique which requires from the surgeon a consummate knowledge of anorectal and urogenital anatomy, and also knowledge of anorectal functions for an adequate procedure and postoperative follow-up.²³

The surgeon must follow-up patients for many years by evaluating fecal continence and directing "biofeedback" physiotherapy^{24,25} treating the patient comprehensively, including psychiatrically.

As Smith affirms,²⁶ each generation of pediatric surgeons brings new techniques and tactics to ARM treatment, which despite all the enthusiasm and hope these may generate, should be thoroughly and critically tested.

CONCLUSIONS

1. PSARP maintained fecal continence in 48.14 percent of the cases and maintained partial continence in 25.92 percent of the cases.
2. Fecal incontinence was associated directly with sacral malformations.
3. Anorectal manometry was useful in evaluating patients, as the degree of continence corresponded to manometric findings.

RESUMO

A anorretoplastia sagital posterior (ARPSP) é o procedimento cirúrgico mais utilizado atualmente para a correção das anomalias anorretais altas e intermediárias. Existe muita controvérsia na literatura a respeito da avaliação pós-operatória desses pacientes. Baseado nesse fato, estudamos 27 casos de anomalias anorretais operados com a ARPSP do ponto de vista clínico e manométrico, com a finalidade de avaliar: 1. Continência fecal; 2. Relação entre a continência fecal e anomalias sacrais associadas; 3. Relação entre a avaliação manométrica pós-operatória e a continência fecal. Da análise dos 27 casos de anomalias anorretais altas e intermediárias, concluímos que: 1. A continência fecal foi conseguida plenamente em 48,14% dos casos, parcialmente em 25,92% dos casos, e a incontinência fecal foi observada em 25,92%; 2. A presença de incontinência fecal foi diretamente relacionada com a associação de anomalias sacrais; 3. A manometria anorretal foi extremamente útil para avaliar os pacientes operados por anomalias anorretais devido à existência de uma relação entre os resultados manométricos e o grau de continência fecal.

REFERENCES

1. Peña A, De Vries SPA. Posterior sagittal anorectoplasty: important technical considerations and new applications. *J Pediatr Surg* 1982; 17(6):796-811.
2. Martins JL, Pinus JQ, Pinus J. Manometria anorretal. In: Penna, FJ, Wheba J, Fagundes Neto U, eds. *Gastroenterologia Pediátrica*, 1^ª ed. Ed. Rio de Janeiro: Medsi, 1983:641-50.
3. Martins JL, Pinus JQ, Pinus J. Manometria anorretal. In: Penna, FJ, Wheba J, Fagundes Neto U, eds. *Gastroenterologia Pediátrica*, 2^ª ed. Ed. Rio de Janeiro: Medsi, 1991:805-11.
4. Martins JL, Pinus JQ, Pinus J. Nova aparelhagem para manometria anorretal de tecnologia brasileira. *Rev Paul Ped* 1990;8(30):108-10.
5. Martins JL. Avaliação pós-operatória de crianças portadoras de anomalias anorretais, submetidas a correção cirúrgica pela anorretoplastia sagital posterior. Tese de Docência Livre, Escola Paulista de Medicina, 1993:111.
6. Siegel S. *Estatística no paramétrica*. Mexico: Ed. Trillas, 1975:346.
7. Schnauffer L, Talbert JL, Haller A, Reid NCRW, Tobon F, Schuster MM. Differential sphincteric studies in diagnosis of ano-rectal disorders of childhood. *J Pediatr Surg* 1967; 2(6):538-43.
8. Eisner M. Functional examination of rectum and anus in normals, in disturbances of continence and defecation and in congenital malformations. *Scand J Gastroenterol* 1972;7:305-08.
9. Ahran P, Faverdin C, Thouvenot J. Anorectal motility in sick children. *Scand J Gastroenterol* 1972;7:309-34.
10. Ahran P, Faverdin C, Devroede G, Dubois F, Coupris L, Pellerin D. Manometric assessment of continence after surgery for imperforate anus. *J Pediatr Surg* 1976;11(2):157-66.
11. Iwai N, Ogita S, Kida M, Fugita Y, Magima S. A clinical and manometric correlation for assessment of postoperative continence in imperforate anus. *J Pediatr Surg* 1979;14(5):538-43.
12. Nagasaki A, Ikeda K, Hayashida Y, Sumitomo K, Sameshima S. Assessment of bowel control with anorectal manometry after surgery for anorectal malformation. *Jap J Surg* 1983;14(3):229-34.
13. Gil-Vernet Huguet JM, Bardji Pascual C, Boix-Ochoa J. Utilidad clinica de la manometria anorretal en la edad pediátrica. *An Esp Pediatr* 1985;22(4):299-305
14. Holschneider AM, Freeman NV. Anatomy and function of the normal rectum and anus. In: Stephens, FD, Smith, ED, eds. *Anorectal Malformations in Children: update 1988*. Birth Defects: Original article series, 1988;24(4):125-54.
15. Haberkorn S, Crispin A, Nixon HH. Assessment of fecal incontinence by means of manometry and defecogram. *J Pediatr Surg* 1974;9:43-7.
16. Mischalany H, Suzuki H, Yokoyama J. Report on the First International Symposium of Anorectal Manometry. *J Pediatr Surg* 1989; 24(4):356-59.
17. Martins JL, Pinus J. Anorectal manometry in the child assessment of 1,153 examinations performed from 1987 to 1995. *Rev Hosp S Paulo-Esc Paul Med* 1995;6(3/4):80-2.
18. Martins JL, Pinus J. Computerized anorectal manometry in the pediatric patient. Initial experience. *Rev Hosp S Paulo-Esc Paul Med* 1995;6(3/4):83-6.
19. Stephens FD, Smith ED. *Anorectal malformations in children*. Chicago: Year Book Medical Publishers, 1971.
20. Holschneider AM. Treatment and functional results of anorectal continence in children with imperforate anus. *Acta Chir Belg* 1983;83:191-204.
21. Scharly AF, Kiesewetter WR. Imperforate anus: anorectosigmoid pressure studies as a quantitative evolution of postoperative continence. *J Pediatr Surg* 1969;4:694-704.
22. Gil-Vernet Huguet JM, Sanchis LF, Marhuenda C, Gimenez AI. Incontinencia de fezes derivada de la atresia rectal. *Cir Ped* 1988;1(2):69-84.
23. Martins JL. Complicações no tratamento das anomalias anorretais. In: Margarido NF, Saad R., Ceconello I, Martins JL, Soares LA, eds. *Complicações em Cirurgia*. 1^ª Ed. Robe Livraria Ed., 1992:297-313.
24. Olness K, Mc Parland FA, Pipher J. Biofeedback: a new modality in the management of children with fecal soiling. *J Pediatr* 1980;96(3):505-9.
25. Gil-Vernet Huguet JM, Perez J, Broto J, Casasa, JM, Boix-Ochoa J. Utilidad y evaluacion del biofeedback post anorretoplastia sagital posterior. *Cir Ped* 1990;3(3):130-5.
26. Smith ED. The bath water needs changing, but don't throw out the baby: an overview of anorectal anomalies. *J Pediatr Surg* 1987;22(4):335-48.