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# Anorectal manometry in children with retentive fecal incontinence: What parameters should we evaluate?☆



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### KEYWORDS

Fecal incontinence;  
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### Abstract

**Introduction:** Children with functional constipation frequently present with alterations in rectal compliance and the urge-to-defecate sensation that can be evaluated through anorectal manometry (ARM). In the present study, we evaluated the usefulness of the parameters obtained through ARM in children with retentive fecal incontinence (RFI).

**Materials and methods:** Children with functional constipation, aged 4 to 17 years, that underwent ARM were included in the study.

**Results:** Of the 35 children evaluated, 21 presented with functional constipation and 14 had functional constipation and RFI. The children with both constipation and RFI tolerated greater volumes of air insufflation for triggering the urge to defecate and reaching maximum tolerance of pain, compared with the children that did not have RFI. We identified the cutoff point of 135 ml of air as the maximum tolerance sensation for distinguishing children with RFI.

**Conclusions:** Maximum tolerance of pain was the most useful parameter for evaluating RFI in children with functional constipation.

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**PALABRAS CLAVE**

Incontinencia fecal;  
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**Manometría anorrectal en niños con incontinencia fecal retentiva: ¿Qué parámetros debemos evaluar?****Resumen**

**Introducción:** Los niños con estreñimiento funcional presentan frecuentemente alteraciones de la distensibilidad y sensación defecatoria, que se pueden valorar mediante manometría anorrectal (MAR). En este estudio evaluamos la utilidad de los parámetros que se obtienen en la MAR en niños con incontinencia fecal retentiva (IFR).

**Material y métodos:** Incluimos a niños de 4 a 17 años con estreñimiento funcional a quienes se realizó MAR.

**Resultados:** Un total de 35 niños fueron incluidos: 21 presentaban estreñimiento funcional y 14, estreñimiento con IFR. Los niños con estreñimiento funcional e IFR toleraron mayores volúmenes en la insuflación de aire para desencadenar urgencia defecatoria y dolor a la máxima tolerabilidad, en comparación con quienes no presentan IFR. Identificamos un punto de corte de 135 ml de aire de máxima tolerabilidad para discriminar niños con IFR.

**Conclusiones:** La máxima tolerabilidad fue el parámetro más útil para evaluar IFR en niños con estreñimiento funcional.

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**Introduction and aims**

In children with functional constipation, there is an increase in rectal compliance, requiring larger stool volumes to reach the threshold of intrarectal pressure for triggering the sensation of the urge to defecate.<sup>1</sup> Alterations in rectal sensitivity and the accumulation of stools are mechanisms that have been described in children with retentive fecal incontinence (RFI).

High-resolution anorectal manometry (ARM) is an increasingly accessible resource. It is utilized to obtain exact information with respect to anorectal function<sup>2</sup> and is indicated in the evaluation of children that present with fecal incontinence.<sup>3</sup> However, the usefulness of the different parameters obtained through ARM in children with RFI has not been precisely described.

The aim of the present study was to evaluate the usefulness of the different values obtained through ARM in children with RFI.

**Materials and methods**

A retrospective, observational, and analytic study was conducted that included children referred to the Physiology and Gastrointestinal Motility Unit diagnosed with functional constipation according to the Rome IV criteria.

ARM was carried out after obtaining the informed consent/assent of the parents and underage children, respectively. The measurements were made with the patient in the left lateral decubitus position after rectal cleansing with a sodium citrate/sodium lauryl sulfoacetate enema. InSIGHT Ultima equipment was employed, and the data analysis was done with the BioVIEW Analysis software (Sandhill Scientific; Highlands Ranch, CO, USA). Resting pressure, maximum pressure, the presence or absence of the

rectoanal inhibitory reflex (RAIR), and dyssynergy were consecutively evaluated. Afterwards, the balloon was manually insufflated to measure the first sensation, the urge to defecate, and the maximum tolerance of pain. Patients in whom the RAIR was not documented were excluded from the study.

**Statistical analysis**

The Student's t test was used to compare the parameters of ARM in children with functional constipation and in children with constipation and RFI. A binary logistic regression analysis was done, in which RFI was the dependent variable and the ARM findings were the independent variables. We evaluated the yield of the ARM variables for distinguishing RFI through the receiver-operating characteristic (ROC) curve. The chi-square test was used for the categorical variables. Statistical significance was set at an alpha error < 0.05.

The present study was conducted in accordance with the principles of the Declaration of Helsinki.

**Results**

Of the 35 children included in the study, 21 presented with functional constipation (60%) and 14 presented with constipation and RFI (40%).

The mean age of the constipation group was 8.8 years (range of 4 to 17) and 10.1 years (range of 6 to 15) in the RFI group. Thirty-seven percent of the children were females and 63% were males.

In the mean comparison between the patients with functional constipation and the patients with RFI, there were statistically significant differences in the parameters of first sensation ( $66.50 \pm 7.54$  vs  $105.70 \pm 17.66$  ml;  $p = 0.029$ ) and maximum tolerance of pain ( $131.43 \pm 63.97$  vs  $194.29 \pm 60.60$  ml;  $p = 0.006$ ), respectively (Table 1).

**Table 1** Values obtained through anorectal manometry in children with functional constipation and children with retentive fecal incontinence.

	Constipation	RFI	p
Resting pressure (mmHg)	41.29 ± 16.31	44.50 ± 18.48	0.602
Maximum pressure (mmHg)	112.05 ± 86.05	121.64 ± 59.20	0.698
First sensation (ml)	66.50 ± 7.54	105.70 ± 17.66	0.029
Urgency (ml)	110.95 ± 56.02	154.21 ± 67.12	0.058
Maximum tolerance (ml)	131.43 ± 63.97	194.29 ± 60.60	0.006

RFI: retentive fecal incontinence.

To evaluate the effects of the ARM parameters of resting pressure, first sensation, maximum tolerance of pain, and the presence or absence of dyssynergy, a binomial logistic regression analysis was done to assess the probability of RFI. The model had 67.6% accuracy and maximum tolerance of pain was the only evaluated variable that showed an influence (OR = 1.019; 95%CI: 1.001-1.037;  $p=0.037$ ).

We plotted ROC curves with the parameters of first sensation, urge to defecate, and maximum tolerance of pain and found statistical significance only in maximum tolerance of pain, with an area under the curve of 0.73 ( $p=0.02$ ). The first sensation and urge to defecate demonstrated areas under the curve of 0.66 ( $p=0.11$ ) and 0.67 ( $p=0.08$ ), respectively. To establish the yield of the maximum tolerance parameter, we employed the Youden index and established a cutoff point of 135 ml of air, with 85% sensitivity, 50% specificity, a positive predictive value of 87.5%, and a negative predictive value of 45%.

A total of 47.6% of the patients with functional constipation presented with some type of dyssynergy, corresponding to 42.9% ( $p=0.52$ ) in the children with RFI.

## Discussion and conclusion

In the present study, the main findings were that the children with RFI had elevated values of sensitivity in relation to the first urge-to-defecate sensation and the maximum tolerance of pain, compared with children that only presented with functional constipation and no fecal incontinence.

Different studies have shown that children with chronic constipation present with rectal compliance alterations.<sup>4</sup> However, the values found for rectal sensitivity have been inconsistent and only a few studies have analyzed the differences between children with RFI and children with functional constipation and no incontinence.

Voskuyl et al.<sup>1</sup> reported that children with RFI required volumes of  $100 \pm 50$  ml to trigger the urge to defecate, whereas the healthy volunteers required volumes of  $82 \pm 38$  ml ( $p < 0.01$ ). However, they found no significant difference in children with constipation and no incontinence. There were significant differences between the three groups in the volumes required to reach the maximum tolerance of pain.

The tolerated volumes for triggering the first sensation, urge to defecate, and maximum tolerance of pain tend to vary, depending on the case series published. Fathy et al.<sup>5</sup> compared the ARM parameters in children with functional constipation and healthy child volunteers and found no

significant differences regarding the first sensation and urge to defecate parameters. However, the children with functional constipation tolerated greater volumes of air ( $215 \pm 66$  ml vs  $134 \pm 27$  ml in the control group) ( $p=0.03$ ). Van den Berg et al.<sup>6</sup> compared the tolerated volumes in healthy children, children that had recovered from functional constipation, and children with constipation at the time of the study. Those authors described significant differences between the three groups in relation to first sensation, urge to defecate, and maximum tolerance of pain, with a greater difference in maximum tolerance of pain ( $p < 0.001$ ).

In our study, we identified a cutoff point of 135 ml of air as the maximum tolerance of pain parameter for children with RFI. Likewise, maximum tolerance was the only variable that reached statistical significance in the multivariate analysis, even though its influence was minimal for predicting RFI. Those results support the proposed pathophysiologic mechanism, in which excessive accumulation of stool in the rectum results in fecal overflow.

Varied alterations in the defecation dynamics in children with functional constipation have been reported,<sup>5</sup> but they appear to have no influence on the development of RFI. In our study, we found anorectal dyssynergy in more than 40% of the children, albeit prevalence was not higher in the children with RFI than in the children that only had constipation.

A limitation of the present study was the number of patients included, as well as the lack of a greater number of reports in the literature for comparing our findings. Nevertheless, our study showed the importance of evaluating the rectal sensitivity parameter in children with RFI, in whom aggressive treatment has demonstrated improvement in those variables.<sup>6</sup>

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## Conflict of interest

The authors declare that there is no conflict of interest.

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