

# ANORECTAL MANOMETRY EVALUATION IN ADULT WOMEN WITH CLINICAL AND URODYNAMIC DIAGNOSTICS OF OVERACTIVE BLADDER

*Avaliação manométrica anorretal de mulheres adultas com diagnóstico clínico e urodinâmico de bexiga hiperativa*

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**ABSTRACT - Background:** Anorectal manometry is a diagnostic method often used in clinical practice for assessing functional anorectal disorders and pelvic floor. The dysfunctional voiding, anorectal and pelvic floor has been considered as contributing factors of the symptoms of overactive bladder. **Aim:** To evaluate the results with anorectal manometry in adult women with clinical and urodynamic diagnostics of overactive bladder. **Methods:** Twenty-five adult women (mean age  $45.5 \pm 11.9$  years) with clinical and urodynamic diagnostic of overactive bladder underwent anorectal manometry and the results of this assessment were compared to a control group of eighteen women (mean age  $33.9 \pm 10.7$  years) with no urinary or intestinal disorders and without clinical criteria for diagnosis of overactive bladder. **Results:** Paradoxical puborectalis contraction occurred in six patients in the overactive bladder group and none of the controls. There were no significant between group differences in the following manometric parameters: rectoanal inhibitory reflex, rectal sensitivity, maximum tolerable volume, resting pressure, and hypertonia at rest. Mean squeeze pressure was 182.2 mmHg in the overactive bladder group versus 148.1 mmHg in the control group. **Conclusion:** Women with overactive bladder had increased incidence of paradoxical puborectalis contraction than women in the control group.

**HEADINGS** - Anorectal manometry. Constipation. Overactive bladder. Urinary incontinence.

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**DESCRITORES** - Bexiga hiperativa. Incontinência urinária. Manometria. Constipação.

**RESUMO - Racional:** A manometria anorretal é método diagnóstico empregado na prática clínica para avaliação de distúrbios funcionais anorretais e do assoalho pélvico. As disfunções miccionais, anorretais e do assoalho pélvico tem sido consideradas como fatores contribuintes dos sintomas de bexiga hiperativa. **Objetivo:** Avaliar os resultados obtidos com manometria anorretal em mulheres adultas com diagnóstico clínico e urodinâmico de bexiga hiperativa. **Métodos:** Vinte e cinco mulheres adultas (média de idade de  $45.5 \pm 11.9$  anos) com diagnóstico clínico e urodinâmico de bexiga hiperativa submeteram-se à manometria anorretal e os resultados obtidos nesta avaliação foram comparados aos de um grupo controle de 18 mulheres (média de idade de  $33.9 \pm 10.7$  anos) assintomáticas do ponto de vista urinário e sem critérios clínicos para diagnóstico de bexiga hiperativa. O grupo de mulheres com bexiga hiperativa foi denominado BH e controle C. **Resultado:** Ocorreram seis (24%) casos de contração paradoxal do puborretal no grupo BH e nenhuma no Grupo C. Houve 13 (52%) ocorrências de hipertonia de repouso isolada ou associada à hipertonia de contração no Grupo BH e sete (39%) no Grupo C. A média de pressão de repouso foi de 80.1 mmHg no Grupo BH e 67.6 mmHg no Grupo C. O total de ocorrência de hipertonia de contração no Grupo BH foi de 7(28%) e 11(61%) no Grupo C. A média de pressão de contração foi de 182.2 mmHg no Grupo BH e 148.1 mmHg no Grupo. Com relação ao reflexo inibitório retoanal, a sensibilidade e a capacidade retal máxima não houve diferença estatisticamente significativa entre os dois grupos. **Conclusão:** As mulheres com bexiga hiperativa apresentaram maior ocorrência de contração paradoxal do puborretal em relação às do grupo controle.

## INTRODUCTION

Anorectal manometry is a diagnostic method often used in clinical practice for assessing functional anorectal disorders and pelvic floor. The dysfunctional voiding, anorectal and pelvic floor has been considered as contributing factors of the symptoms of overactive bladder.

Overactive bladder is currently one of the foremost study topics in urology, be it due to its prevalence or to its major impact on the quality of life of affected individuals<sup>3</sup>. Overactive bladder is defined by urinary urgency (with or without loss of urine) that may be associated with increased daytime or nighttime urinary frequency<sup>1</sup>.

The genitourinary and gastrointestinal tracts share the same embryology, location, and sacral innervation. In the literature, this has served as a basis for imparting an understanding of the interconnected nature of lower urinary tract and anorectal dysfunction. Nevertheless, voiding and intestinal dysfunction were long regarded as unrelated events<sup>14,15,16,21</sup>. The management of voiding disorders of either system now takes their close relation into account, particularly in the pediatric setting<sup>5,22</sup>.

Patients with disordered coordination between the pelvic floor muscles during micturition and defecation often present with associated symptoms, such as post-void residual, urinary urgency, increased urinary frequency, recurrent urinary tract infections, chronic perineal pain and obstructed defecation<sup>6,9,14,16,17,19,22,24</sup>.

Studies have focused on the correlation between micturition disorders and anorectal dysfunction in the adult population, but not as thoroughly as in children<sup>4,7,20</sup>.

The present study aimed to evaluate the results obtained with anorectal manometry in adult women with clinical and urodynamic diagnostics of overactive bladder.

## METHODS

This study was approved by the Faculdade de Medicina da Universidade de Brasília Human Subject Research Ethics Committee (protocol no. 004/2009) and carried out at the Hospital Universitário de Brasília in the Services of Coloproctology and Urology, between May 2009 and March 2010.

Fifty-three female volunteers aged from 21 to 67 years were included in the study. Twenty-five adult women (mean age  $45.5 \pm 11.9$  years) with clinical and urodynamic diagnostic of overactive bladder underwent anorectal manometry and the results of this assessment were compared to a control group of 18 women (mean age  $33.9 \pm 10.7$

years) with no urinary or intestinal disorders and without clinical criteria for diagnosis of overactive bladder. The group of women with overactive bladder was named OB and the control group was designed C. All subjects provided written informed consent for participation.

Women in the OB group exhibited detrusor contraction during the filling phase of urodynamic evaluation. Women in group C did not undergo urodynamic evaluation and did not meet clinical criteria for overactive bladder. Recruitment of volunteers for the control group was conducted by means of verbal invitations. Women meeting any clinical criteria for urge incontinence, those with clinical evidence of active urinary tract infection, diabetes mellitus, past or current neurologic dysfunction, or a history of stroke were excluded from the sample, as were women taking anticholinergics and any who were unable to engage in the study interview.

Urodynamic testing was performed with a Dynapack MPX 816 system (Dynamed, São Paulo, Brazil). Detrusor pressure (Pdet) was calculated indirectly by subtracting the abdominal pressure (Pabd) from the vesical pressure (Pves): ( $Pdet = Pves - Pabd$ ). Vesical, abdominal, and detrusor pressures, as well as urinary flow and micturition pressures, were calculated and recorded automatically by the Uromaster II 2.34 software package. Two urinary catheters were employed: a 6 Fr catheter for Pves recording and an 8 Fr catheter for intravesical infusion. Pabd was measured with a 10 Fr balloon catheter (inflated with 20 ml distilled water). An urodynamics chair with flowmeter attached to the collecting system was used for analysis of voiding pattern and measurement of urinary flow.

Patients were placed in the supine position and the urethral and rectal catheters were placed after cleansing of the genital area (using aseptic technique). The testing protocol included cystometry and pressure flow study.

The first stage of urodynamic evaluation consisted of cystometry. For this stage, room-temperature normal saline solution (NaCl 0.9%) was instilled into the bladder at a rate of 30 ml/min. When patients first reported the urge to urinate or after at least 150 ml of saline had been instilled into the bladder, patients were instructed to cough and perform Valsalva maneuvers. In patients with micturition-related complaints such as increased urinary frequency, nocturia, or urinary urgency, a provocative test was performed, which consisted of increasing the rate of intravesical infusion to  $>120$  ml/min.

The second stage consisted of the pressure flow study. After removal of the urinary catheter, patients had voiding stimulation while sitting in an urodynamics chair with attached flowmeter.

The diagnosis of overactive bladder was confirmed when detrusor contraction (with or without urinary loss) occurred at any point in time during cystometry—regardless of whether contraction was a consequence of provocative testing or occurred at any point of the filling phase of urodynamic evaluation—or when Pdet increased due to maneuvers meant to increase abdominal pressure.

Anorectal manometry was performed with a Dynapac MPX816 eight-channel manometer (Dynamed, São Paulo, Brazil). A radial silicone catheter with a diameter of 0.5 cm was used for measurement of anal canal pressures. Patients were placed in the left lateral decubitus position and the catheter was placed at the height of the anus for calibration. After calibration, the catheter was lubricated with gel, introduced into the anus, and advanced until the distal end was 6 cm from the anal orifice. At the start of the examination, patients were instructed to relax the anal region for measurement of resting pressure. Patients were then asked to contract (for squeeze pressure measurement) and, finally, to strain as if defecating (for measurement of anal pressures during Valsalva maneuvers). This series of measurements was repeated six consecutive times. With each set of measurements, the examiner manually withdrew the catheter 1 cm caudad.

For the second portion of the examination, the balloon was repositioned 6 cm distal to the anus and inflated with air in a stepwise fashion. As the balloon was inflated, patients were asked when they first felt a rectal stimulus for assessment of sensitivity. Inflation continued until the patient reported the urge to defecate. With the balloon inflated to the first volume that elicited an urge to defecate, the patient was then asked to perform Valsalva maneuvers for assessment of anal canal pressures in the presence of relaxation or contraction of the pelvic floor muscles.

Finally, with the catheter placed in the highest-pressure zone of the functional anal canal, the balloon was quickly inflated with 20–60 ml of air to distend the rectal walls and test for presence or absence of the rectoanal inhibitory reflex (RAIR).

Data were analyzed with the ProctoMaster 5.1 software package (Dynamed, São Paulo, Brazil) and interpreted using the parameters considered normal for female subjects of each participant's age as a reference. Normal ranges were defined as follows: resting pressure, 40–70 mmHg; squeeze pressure, 100–180 mmHg; functional anal canal length, 2–3 cm; RAIR present; rectal sensitivity, 10–30 ml; maximum tolerable volume, 100–250 ml; and absence of anal canal pressure during defecation.

## Statistical analysis

Statistical analyses were performed in the SPSS (Statistical Package for the Social Sciences) 17.0 software environment (SPSS Inc., Chicago, IL). The Student t-test was used for between-group comparison of mean squeeze and resting pressure. All other parameters were compared by means of a chi-square test. The significance level was set at 5% ( $p < 0.05$ ).

## RESULTS

The OB group consisted of 25 subjects with a mean age of  $45.5 \pm 11.9$  years. Group C was composed of 18 participants with a mean age of  $33.9 \pm 10.7$  years.

Anorectal signs and symptoms, such as loss of stool or flatus, pain or bleeding during defecation, and tenesmus, are described in Table 1.

**TABLE 1** - Frequency of anorectal signs and symptoms in women with overactive bladder (OB) and healthy controls (C)

Symptoms and complaints	OB n = 25 (100%)	C n = 18 (100%)	p-value
Constipation	13 (52%)	0 (0)	0.31
Fecal incontinence	1 (4%)	1 (5.5%)	0.83
Pain on defecation	2 (8%)	0 (0)	0.95
Bleeding on defecation	3 (12%)	3 (16%)	0.99
Tenesmus	5 (20%)	1 (5.5%)	0.09

Recurrent urinary tract infection (defined as three or more episodes during the 12 months preceding the study) occurred in five subjects in group OB (20%) and two subjects in group C (11%) ( $p = 0.06$ ).

Complaints indicative of voiding dysfunction are presented in Table 2.

**TABLE 2** - Frequency of complaints indicative of voiding dysfunction in women with overactive bladder (OB) and healthy controls (C)

Symptoms and complaints	OB n = 25 (100%)	C n = 18 (100%)	p-value
Urinating difficulty	1 (4%)	0 (0)	0.99
Weak and/or intermittent urine stream	1 (4%)	0 (0)	0.99
Feeling of incomplete emptying	2 (8%)	1 (5.5%)	0.87
Constant feeling of bladder fullness	3 (12%)	0 (0)	0.00
Overall	7 (28%)	2 (11%)	0.04

### Anorectal manometry parameters

The frequency of anal hypertonicity (during contraction alone or at rest as well) is shown in Table 3.

**TABLE 3** - Frequency of high squeeze pressure alone, high squeeze pressure + high resting pressure, and overall high squeeze pressure in women with overactive bladder (OB) and healthy controls (C)

High squeeze pressure	OB n = 25 (100%)	C n = 18 (100%)	p-value
Alone	1 (4%)	6 (33%)	0.01
+High resting pressure	6 (20%)	5 (28%)	0.25
Overall	7 (28%)	11 (61%)	0.34

Mean squeeze pressures in group C were significantly higher than in group OB ( $p=0.02$ , Table 4).

**TABLE 4** - Means, standard deviations and standard errors of means for squeeze and resting pressures in women with overactive bladder (OB) and healthy controls (C)

	Mean (mmHg)	Standard deviation	Standard error
Squeeze pressure			
C	182.2	48.5	11.4
OB	148.1	45.0	9.0
Resting pressure			
C	67.6	17.5	4.1
OB	80.1	37.4	7.4

The frequency of anal hypertonicity at rest (alone or during contraction as well) is shown in Table 5.

**TABLE 5** - Frequency of high resting pressure alone, high resting pressure + high squeeze pressure, and overall high resting pressure in women with overactive bladder (OB) and healthy controls (C)

High resting pressure	OB n = 25 (100%)	C n = 18 (100%)	p-value
Alone	7 (28%)	2 (11%)	0.07
+High squeeze pressure	6 (20%)	5 (28%)	0.25
Overall	13 (52%)	7 (39%)	0.39

Squeeze and resting pressures for both groups (means, standard deviations, and standard errors) are shown in Table 4.

Mean resting pressures in group OB were higher than in group C, but the difference did not reach statistical significance ( $p = 0.15$ , Table 4).

Five women (20%) in the overactive bladder group (OB) exhibited hypotonia, versus two subjects (11%) in the control group (C). There was no statistically significant between-group difference ( $p=0.64$ ).

Paradoxical puborectalis contraction occurred in six subjects in group OB and in none of the healthy controls - significant difference ( $p=0.01$ , Table 6).

Paradoxical contraction: increased sphincter pressure during Valsalva maneuvers

Other findings, including RAIR, rectal sensitivity, and maximum tolerable capacity (Table 7).

**TABLE 6** - Frequency of increased sphincter pressure during Valsalva maneuvers (paradoxical puborectalis contraction) in women with overactive bladder (OB) and healthy controls (C): paradoxical contraction alone, paradoxical contraction with hypotonia, and paradoxical contraction with high squeeze and/or resting pressure

Manometric parameters	OB n = 25 (100%)	C n = 18 (100%)	p-value
Paradoxical contraction alone	3 (12%)	0 (0)	0.07
Paradoxical contraction + high squeeze pressure alone	1 (4%)	0 (0)	0.32
Paradoxical contraction + high resting pressure alone	2 (8%)	0 (0)	0.34
Paradoxical contraction + high squeeze pressure + high resting pressure	0 (0)	0 (0)	0.53
Paradoxical contraction + hypotonia	2 (8%)	0 (0)	0.53
Overall	6 (24%)	0 (0)	0.01

**TABLE 7** - Presence or absence of rectoanal inhibitory reflex (RAIR), normal or altered rectal sensitivity, and normal or altered maximum rectal capacity (tolerable volume) in women with overactive bladder (OB) and healthy controls (C)

Manometric findings	OB n = 25 (100%)	C n = 18 (100%)	p-value
RAIR			
Present	25 (100%)	17 (94.5%)	1.00
Absent	0 (0)	1 (5.5%)	
Sensitivity			
Normal	24 (96%)	18 (100%)	1.00
Altered	1 (4%)	0 (0)	
Maximum tolerable volume			
Normal	21 (84%)	18 (100%)	0.99
Altered	4 (16%)	0 (0)	

## DISCUSSION

In the present study, high resting pressures (alone or in association with high squeeze pressure) occurred more often in women with overactive bladder than in controls. Mean resting pressures were also higher in the OB group. However, these differences were not statistically significant. Data analysis shows a trend toward significance ( $p=0.07$ ) for isolated high resting pressures. A larger study sample might yield findings in support of the hypothesis that isolated sphincter hypertonia at rest may correlate with bladder voiding symptoms. Despite the lack of statistical significance, the findings of the present study corroborate those obtained by Major et al.<sup>18</sup>, who found that hypertonia due to uncoordinated and dysfunctional sphincter activity may play a role in overactive bladder symptoms.

Between-group comparisons revealed a higher frequency of high squeeze pressures (with no resting hypertonia) in group C. Mean squeeze pressures were also significantly higher in this group ( $p=0.02$ ). As for



the finding of increased squeeze pressure with no other manometric abnormalities in asymptomatic women, it should be interpreted in light of the psychosomatic inhibitions and behavioral considerations inherent to this type of examination and this region of the body.

The greater frequency of isolated high squeeze pressures found in the control group of the present study is not consistent with the results reported by Major et al.<sup>18</sup>, Kuo<sup>17</sup>, and Minardi et al.<sup>20</sup>, which corroborate the hypothesis that voiding dysfunction may be related to detrusor hyperactivity.

The younger mean age and higher frequency of nulliparity in group C may explain the higher rates of squeeze hypertonia and higher mean squeeze pressures in this group. Nearly all subjects in group OB were multiparous (92%), versus only 23% in group C (a statistically significant difference). Age and parity play relevant roles in the etiology of anatomical dysfunction and nerve injury of pelvic structures, and particularly of the pelvic floor<sup>11,23</sup>. Therefore, in the present study, women in group C were less likely to have sustained pelvic floor muscle injury.

Over the past few decades, a growing number of studies have attempted to gain a keener understanding of the influence of defecation disorders on micturition.

Minardi et al.<sup>20</sup>, using perineal ultrasound, found that women with recurrent urinary tract infections and dysfunctional voiding had increased urethral sphincter volume when compared both to women with dysfunctional voiding and no recurrent urinary tract infections and to healthy women.

In the present study, recurrent urinary tract infection was reported by five women in group OB (20%) versus two women in group C (11%). Complaints indicative of voiding dysfunction were more frequent in group OB (seven subjects, 28%) than in group C (two, 5.5%) ( $p=0.04$ ). Of the various signs and symptoms found in the sample, a constant sensation of bladder fullness was reported by three women in the OB group and none in the control group ( $p=0.00$ ). These findings are consistent with those reported by Minardi et al.<sup>20</sup>.

Another mode of pelvic floor dysfunction being actively researched in female subjects is infravesical obstruction. Obstruction at the infravesical level is less common in women than in men. Insufficient striated sphincter relaxation, pelvic floor hypertonia or hypertrophy, or both may also act as obstructive factors<sup>8,10,13,23</sup>.

Another interesting finding of this study concerns defecation: 13 women in the overactive bladder group (52%) were affected by constipation. Paradoxical puborectalis contraction occurred in six women, all in the OB group. There were no cases of paradoxical puborectalis contraction in group C. These findings are consistent with those of prior studies that defend the hypothesis of pelvic floor –bladder incoordination as an etiology for abnormal urinary frequency, urinary urgency, incontinence, and recurring urinary tract

infection in non-neuropathic children<sup>2,12</sup>.

The small study sample notwithstanding, one may reasonably assume from the findings presented herein (greater frequency of constipation and paradoxical puborectalis contraction in the OB group) that there is indeed a relationship between constipation and voiding dysfunction, with particular emphasis on defecation, due to incoordination of the pelvic floor.

Bearing in mind that the pelvic floor muscles constitute a single structure shared by three physiological systems, urinary (vesical), gastrointestinal (bowel), and genital (sexual), the results of the present study reinforce the hypothesis that compromise of any of these functions may adversely affect the others.

Considering the data currently available in the literature, the findings reported herein - any methodological limitations notwithstanding - pave the way for new research directions focusing on the close relationship between micturition disorders and anorectal dysfunction in adult women with overactive bladder.

The sophisticated imaging technique of three-dimensional ultrasound may become an important tool for objective, clear, dynamic, functional, and anatomical assessment of the pelvic floor, both for research purposes and in clinical practice. Studies using this imaging modality may come to provide major insights on the mechanisms underlying pelvic floor muscle injury in women with lower urinary and anorectal complaints. Three-dimensional ultrasound, with or without other imaging methods for pelvic floor examination, may also be used for assessment of conservative or surgical treatment response in women with voiding dysfunction.

## CONCLUSION

Women with overactive bladder had increased incidence of paradoxical puborectalis contraction than women in the control group.

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