

Does the Method of Cystometry Affect the Incidence of Involuntary Detrusor Contractions? A Prospective Randomized Urodynamic Study

Jerry G. Blaivas,* Asnat Groutz, and Michael Verhaaren

Weill Medical College, Cornell University, New York, New York

The International Continence Society (ICS) defines overactive detrusor as “one that is shown objectively to contract during the filling phase *while the patient is attempting to inhibit micturition.*” The aim of the present study was to assess whether instructing the patient neither to try void nor to inhibit micturition during filling cystometry may improve the detection rate of involuntary detrusor contractions (IDCs). Forty-two consecutive patients (mean age 65 ± 13.5 years), referred for urodynamic evaluation of persistent irritative lower urinary tract symptoms were prospectively enrolled. All patients were presumed, by history, to have IDCs. Cystometry was performed twice at the same session, each time by using randomly different instructions: Method 1, patients were instructed to try to inhibit micturition during bladder filling; and Method 2, patients were instructed to neither try to void nor try to inhibit micturition, but simply report his or her sensations to the examiner. The occurrence, as well as the urodynamic characteristics of IDCs, were analyzed separately and compared between the two filling methods. Method 1 identified only 20 cases of IDCs, while Method 2 identified 27 cases (48 versus 64% of the study population, respectively; $P = 0.02$). Analysis of urodynamic characteristics revealed a clear trend of reduced bladder volume at which IDCs occurred when patients were instructed to neither try to void nor to inhibit micturition during bladder filling; however, statistical significance was not established (189 ± 122 versus 240 ± 149 mL, respectively; $P = 0.13$). All other urodynamic characteristics of IDCs were similar in both methods. In conclusion, better detection rates of IDCs were achieved by instructing the patient to neither try to void nor try to inhibit micturition, but simply report his or her sensations to the examiner, during filling cystometry. If the patient is instructed to inhibit micturition during bladder filling—about 26% of the IDC cases are misdiagnosed. *Neurourol. Urodynam.* 20:141–145, 2001. © 2001 Wiley-Liss, Inc.

Key words: detrusor overactivity; cystometry; urodynamics

INTRODUCTION

The International Continence Society (ICS) defines overactive detrusor function as “*involuntary detrusor contractions during the filling phase, which may be spontaneous or provoked and which the patient cannot completely suppress . . . The unstable*

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*Correspondence to: Jerry G. Blaivas, M.D., 400 East 56 Street, New York, NY 10022.

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detrusor is one that is shown objectively to contract, spontaneously or on provocation, during the filling phase while the patient is attempting to inhibit micturition" [Abrams et al., 1988]. However, during bladder filling, many patients are able to prevent the onset of an involuntary detrusor contraction (IDC) by trying to inhibit voiding [Romanzi et al., 2001]. Thus, if the ICS recommendations are followed these patients will be misdiagnosed.

The aim of the present study was to assess whether instructing the patient neither to try void nor to inhibit micturition during filling cystometry may improve the detection rate of IDCs. We therefore prospectively compared two filling modes: *Method 1*, patients were instructed to try to inhibit micturition during bladder filling; and *Method 2*, patients were instructed to neither try to void nor try to inhibit micturition, but simply report his or her sensations to the examiner.

METHODS

Forty-two consecutive non-neurogenic patients (32 women and 10 men), referred for urodynamic evaluation of persistent irritative lower urinary tract symptoms (urinary frequency, urgency, nocturia, and/or urge incontinence) were prospectively enrolled. All patients were presumed, by history, to have IDCs and underwent detailed clinical evaluation, which included a complete history and physical examination, urinary questionnaire, the American Urological Association (AUA) symptom index score, 24-hour voiding diary, 24-hour pad test, urine culture, noninvasive uroflowmetry (free-flow), postvoid residual urine volume, multichannel video urodynamics and urethrocytostcopy.

The cystometrogram was performed in the sitting position, using a 7-F double-lumen transurethral catheter through which room temperature, radiographic contrast was infused at a medium filling rate (75–100 mL/s). Bladder filling was discontinued at functional bladder capacity (defined as the largest voided volume in a 24-hour voiding diary), or prior to this if the patient experienced a strong desire to void. Further filling was avoided. Patients were asked to confirm their voiding complaints were reproduced by the study. Subsequently, patients were asked to void with the 7F transurethral catheter in place. Pressure-flow studies, in the sitting position, with simultaneous video fluoroscopy of the bladder outlet and perineal surface electromyography (EMG) measurements were undertaken. Cystometry was performed twice at the same session, each time by using randomly different instructions: 1) *Method 1*, patients were instructed to try to inhibit micturition during bladder filling ("Do not urinate, try to hold as much as you can"); and 2) *Method 2*, patients were instructed to neither try to void nor try to inhibit micturition, but simply report his or her sensations to the examiner ("Do not try to hold. Just tell me what you feel"). Patients were randomly assigned, by their birth date, to have one of the two methods as the first filling mode and the second method immediately thereafter.

All urodynamic tracings were manually inspected and the following parameters were assessed:

1. first sensation,
2. cystometric capacity,
3. bladder volume at time of IDC, and
4. detrusor pressure at time of IDC.

An IDC was defined as a sudden rise in detrusor pressure, of any magnitude, which was not voluntary. IDCs were distinguished from changes in compliance by stopping the bladder infusion. In patients with IDCs, the detrusor pressure remains elevated; in those with compliance changes, the pressure falls to its prior level. In doubtful cases ancillary information was used to confirm the presence of an IDC: sudden urge to void, opening of the vesical neck, or sudden relaxation seen on the sphincter electromyography.

The occurrence, as well as the urodynamic characteristics of IDCs, were analyzed separately and compared between the two filling methods. Results were analyzed statistically by Student's *t*-test, and χ^2 test. $P < 0.05$ was considered significant.

RESULTS

Forty-two consecutive patients, 32 women and 10 men, were prospectively enrolled. The mean age of the patients was 65 ± 13.5 years. Twenty-five (78%) women were postmenopausal, eight (32%) of whom were using hormone replacement therapy.

All patients had irritative lower urinary tract symptoms and were presumed, by history, to have IDCs. The mean AUA symptom index score of the patients was 16 ± 6.9 . The mean number of day-time and nocturnal micturition episodes per 24-hour voiding diary was 9.7 ± 3.6 and 2.2 ± 1.8 , respectively. The mean urinary loss per concomitant 24-hour pad test was 93.5 ± 105.0 grams.

Overall, IDCs were demonstrated in 27 patients (64% of the study population), seven of whom (26% of the IDC cases; $P = 0.02$) were diagnosed only when patients were instructed to neither try to void nor to inhibit micturition during bladder filling.

We further analyzed whether the order by which the specific filling method was randomly performed affected the results. Two consecutive fillings (each time by a different examination method) were undertaken at the same clinical session. Overall, first cystometry revealed IDCs in 24 patients (57% of the study population), while second cystometry revealed IDCs in 23 patients (55% of the study population). Statistical comparison between the methods by which the first cystometry was performed, failed to reveal any significant difference. Specifically, 19 patients were instructed to inhibit micturition during their first cystometry, 11 (58%) of whom were found to have IDCs. Twenty-three other patients were instructed to neither try to void nor to inhibit micturition during their first cystometry, 13 (57%) of whom were found to have IDCs.

Twenty patients were found to have IDCs by both methods. Analysis of urodynamic characteristics revealed a clear trend of reduced bladder volume at which IDCs occurred when patients were instructed to neither try to void nor to inhibit micturition, however statistical significance was not established (189 ± 122 versus 240 ± 149 mL, respectively; $P = 0.13$). All other urodynamic characteristics of IDCs were similar in both methods (Table I).

Seven patients (26% of the IDC cases) were diagnosed correctly only by the suggested method. These patients (Group 1) were compared with the twenty patients (Group 2) in whom IDCs were detected by both methods. A clear trend of lower detrusor pressure at the time of IDCs was demonstrated in Group 1 patients compared with Group 2 patients; however, due to the relatively small series, statistical significance was only marginal (26.7 ± 19.1 versus 47.4 ± 30.6 cm H₂O, respectively; $P = 0.07$). All other urodynamic characteristics of IDCs were similar in both groups (Table II).

TABLE I. Urodynamic Characteristics of IDC Cases Detected by Both Methods (N = 20)

Mean \pm SD	Method 1	Method 2
First sensation (mL)	133 \pm 96	117 \pm 74
Cystometric capacity (mL)	322 \pm 180	299 \pm 179
Bladder volume at IDC (mL)	240 \pm 149	189 \pm 122
Detrusor pressure at IDC (cm H ₂ O)	48.3 \pm 30.7	47.4 \pm 30.6

TABLE II. Comparison of IDC Cases Detected by the Suggested Method Only (Group 1, N = 7) versus Cases Detected by Both Methods (Group 2, N = 20)

Mean \pm SD	Group 1 N = 7	Group 2 N = 20
First sensation (mL)	162 \pm 117	117 \pm 74
Cystometric capacity (mL)	362 \pm 77	299 \pm 179
Bladder volume at IDC (mL)	237 \pm 145	189 \pm 122
Detrusor pressure at IDC (cm H ₂ O)	26.7 \pm 19.1	47.4 \pm 30.6

DISCUSSION

Results of the present study suggest better detection rates of IDCs by instructing the patient to neither try to void nor try to inhibit micturition, but simply report his or her sensations to the examiner, during the filling phase of the urodynamic study.

The ICS definition of the overactive detrusor is a cystometric one, i.e., the presence of an IDC must be urodynamically demonstrated. According to these recommendations, diagnosis of unstable detrusor is established when IDCs are demonstrated when the patient “*is attempting to inhibit micturition*” [Abrams et al., 1988]. However, the normal bladder needs no such coaxing. Normal storage of urine is dependent on (1) spinal reflex mechanisms that activate sympathetic and somatic pathways to the urethral outlet, and (2) tonic inhibitory systems in the brain that suppress the parasympathetic excitatory outflow to the urinary bladder [De Groat, 1997]. The neuronal control of the detrusor function may be altered by damage to the central inhibitory pathways, sensitization of peripheral afferent terminals, learned behavior, or voluntary contraction or relaxation of the pelvic floor muscles. We have previously shown that approximately 50% of patients with IDCs are able to abort them by attempting to inhibit micturition [Romanzi et al., 2000]. Thus, instructing the patient to try to inhibit voiding during cystometric bladder filling may result in preventing the appearance of potential IDCs.

All our patients had irritative lower urinary tract symptoms and were presumed, by history, to have IDCs. At first cystometry, detection rates of IDCs were similar by both methods. However, if the overall improved detection rate associated with the suggested method was due to the completion of a second study, then higher detection rates of IDCs should have been expected following the second study, regardless of the filling method. This was not the case. Overall, the first cystometry revealed IDCs in 24 patients (57% of the study population), while the second cystometry revealed IDCs in 23 patients (55% of the study population). We therefore analyzed all cases of IDCs, regardless of the order of the test. Overall, IDCs were demonstrated in 27 patients (64% of the study population), seven of whom (26% of the IDC cases) were missed when patients were instructed to inhibit micturition during bladder filling. We believe these findings imply that instructing the patient to neither try to void nor try to inhibit micturition, but simply report

his or her sensations to the examiner during bladder filling, is associated with improved detection rate of IDCs.

These findings are in accordance with the clinical observation that patients with overactive detrusor may benefit from behavioral modification and pelvic floor exercises. Pelvic floor exercises were originally offered for patients with stress urinary incontinence. However, enhanced external sphincter tone is known to suppress detrusor overactivity. This physiologic mechanism was the rational one for treating patients with overactive detrusor by pelvic floor exercises. Several studies have shown that patients with detrusor overactivity may benefit from behavioral modification and pelvic floor rehabilitation techniques [Fantl et al., 1991; Elser et al., 1999]. Although the specific mechanisms by which the clinical improvement is achieved are still unknown, it is likely that this is at least partly due to the induced inhibition of detrusor activity by sphincteric contractions, as well as adaptive behavioral changes.

Conventional urodynamics is still considered as the gold standard in diagnosing voiding dysfunction. We believe its role as the major diagnostic tool in the evaluation of lower urinary tract symptoms needs no further validation. However, there is a need to re-assess the formal recommendations for both technical aspects and diagnostic terms of overactive bladder [Artibani, 1997; Hampel et al., 1997; Abrams and Wein, 1999; Blaivas, 1999]. The suggested filling method, presented in our study, is simple, practical, easy to apply and associated with an improved detection rate of IDCs. We therefore recommend using this method routinely in any urodynamic study.

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