



## Research Article

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# Minimally Invasive Urodynamics: “One-Exam-Fits-All”?

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## Abstract

**Aims:** To evaluate whether minimally invasive urodynamics (MIU) is capable of being performed by men with characteristics that may affect the ability to perform the exam, such as cognitive impairment and increased abdominal circumference.

**Methods:** Male patients who were on the waiting list for urodynamic assessment with complaints of storage and emptying low urinary tract symptoms (LUTS) were analyzed in a prospective and randomized manner. All patients underwent the 3 phases of the urodynamic study, with replacement of the uroflowmetry stage by MIU. Before the exam, patients were asked to fill out, the Brazilian version of the Cognitive Failures Questionnaire (CFQ) and were classified into three ranges based on the sum of their points: 0–30, 31–60, and 61–100. After completing the exam, patients had their abdominal circumference measured and were classified into three ranges: 60–90, 91–101, and 102–132 cm.

**Results:** Sixty-three patients were invited to undergo the urodynamic evaluation with the uroflowmetry phase replaced by the minimally invasive study, and 62 (98.4%) were able to perform the exam. There was no statistically significant difference between the examination when considering cognitive data ( $p = 0.2226$ ) or abdominal circumference ( $p = 0.9531$ ).

**Conclusion:** MIU is an excellent option for the diagnosis and therapeutic follow-up of intravesical obstruction in men, even in patients with increased abdominal circumference or cognitive changes.

**Keywords:** Minimally invasive urodynamics; low urinary tract symptoms; bladder outlet obstruction; abdominal circumference; cognitive disorders

## Introduction

The role of urodynamic assessment for the diagnosis of bladder emptying disorders is well established. Pathological conditions such as bladder outlet obstruction (BOO) and detrusor underactivity, for example, find their gold standard for diagnosis in urodynamics [1]. However, urodynamics offer some challenges as well. It is an invasive, time-consuming, and expensive exam [2] that presents a significant potential for undesirable effects during (embarrassment) and after (dysuria, macroscopic hematuria and urinary tract infection) its implementation [3]. In this context,

alternative, minimally invasive options have been gaining ground, especially with regard to the diagnosis of BOO in men – one of the main pieces of information to help make therapeutic decisions in benign prostatic hyperplasia associated with lower urinary tract symptoms (LUTS) [4]. The ultimate objective is to enable early treatment, before an individual develops damage to their detrusor muscle.

Since Schafer and collaborators first described the minimally invasive urodynamics (MIU) method in 1994 [5] many devices

and techniques have emerged in this field. Most methods analyze isometric bladder pressure resulting from interruption of urinary flow during the patient's spontaneous urination. The method developed by D'Ancona and collaborators in 2008 follows the same precepts proposed by Schafer, but with the development of a new device, which must be fitted into the navicular fossa through the external urethral meatus [6]. The method minimizes cost, discomfort, and rates of urinary infection [7]. To implement the MIU, however, patients must have good visualization of the penis since it is up to them to insert (under medical supervision) and hold the device throughout urination. Considering this point, we raised the hypothesis that men with increased abdominal circumference and/or cognitive deficits could have difficulties in carrying out this diagnostic assessment. In this study we aim to evaluate whether MIU is capable of being performed by men with characteristics that may affect the ability to perform the exam, such as cognitive impairment and increased abdominal circumference.

## Materials and Methods

After authorization from the local Ethics and Research Committee, male patients who were on the waiting list for urodynamic assessment with complaints of storage and emptying LUTS were analyzed in a prospective and randomized manner. Randomization was performed by computer. Patients were excluded if they had suspicion or presentation of central or peripheral neuropathies, retinopathies, blindness, hand tremor, or diabetes mellitus. All patients underwent the 3 phases of the urodynamic study (uroflowmetry, cystometry and voiding pressure/flow study), with replacement of the uroflowmetry stage by minimally invasive urodynamics. Testing occurred from January to October 2023, in our urodynamic center, using the latest version of Dynamed™ (Dynamed™), urodynamic equipment (Dynapack Slim™ Hardware and Urocommander™ Software). All testing followed the recommendations for good practice endorsed by the International Continence Society (ICS) [8-10]. Before the exam, patients were asked to fill out, on their own, the Brazilian version of the Cognitive Failures Questionnaire (CFQ).

This questionnaire is a self-report instrument containing 25 questions about cognitive failures committed by adults on a daily basis. The instrument was standardized for clinical use and validated for use in Brazil [11,12]. The questionnaire has a brief and relatively simple application and provides an ecological variable, representing the frequency, intensity and pattern of cognitive failures that the subject presents in everyday life. The results range from 0 to 100 and higher scores indicate a greater occurrence of cognitive failures. Patients were classified into three ranges based on the sum of their points: 0-30, 31-60, and 61-100. After completing the exam, patients had their abdominal circumference measured using a flexible measuring tape, using the navel as a reference [13]. Patients were classified into three ranges: 60-90, 91-101, and 102-132 cm. Statistical analysis was performed using GraphPad Prism™ software, version 7, applying Kolmogorov-Smirnov's test for normality analysis. For data with a Gaussian distribution, a comparative intergroup evaluation Student's t-test was used. However, for data with a non-Gaussian distribution, the Kruskal-Wallis's test was used, adopting the standard significance value of  $p < 0.05$ .

## Results

Sixty-three patients were invited to undergo the urodynamic evaluation with the uroflowmetry phase replaced by the minimally invasive study, and 62 (98.4%) were able to perform the exam. Demographic characteristics are shown in Table 1. The only patient who was unable to perform the exam had difficulty fitting the device into his external urethral meatus/navicular fossa. The man's cognitive data and abdominal circumference measurements were within normal limits. Results of the cognition questionnaire and measurement of the abdominal circumference of the patients who were able to undergo the minimally invasive assessment are shown in Tables 2&3, respectively. There was no statistically significant difference between the examination when considering cognitive data ( $p = 0.2226$ ) or abdominal circumference ( $p = 0.9531$ ).

**Table 1:** Patient's demographic characteristics.

Age (years)	Range	Mean	University
	44-84	69	
Ethnicity	Caucasian	Afro-descendant	
	23	40	
Education	No/primary	Secondary or High	
	38	23	2

**Table 2:** Results of the Cognitive Failures Questionnaire (CFQ) of the patients who were able to undergo MIL evaluation.

Patients' score in Cognitive Failures Questionnaire (CFQ)	Range	Mean		
	0-87	45		
Number of patients	Range 1 (0-30 points)	Range 2 (31-60 points)	Range 3 (61-100 points)	
	21	33	8	P=0.2226

**Table 3:** Results of the abdominal circumference of the patients who were able to undergo MIU evaluation.

Abdominal Circumference	Range	Mean		
		64-132cm	105 cm	
Number of patients	Range 1 (60-90cm)	Range 2 (91-101cm)	Range 3 (102-132cm)	
	17	20	25	P=0.9531

## Discussion

Due to its diagnostic accuracy, MIU is a viable and easily repeatable option for identifying BOO and monitoring its treatment, but there are no previous studies evaluating whether this type of exam can be applied to men with high abdominal circumference and/or cognitive impairment. It can be challenging to perform diagnostic procedures on obese individuals. Research in the area of abdominal imaging highlights the difficulty of performing magnetic resonance imaging, computed tomography, and ultrasound in this population [14,15]. Our findings, however, demonstrate that, even in patients with increased abdominal circumference, where difficulty in visualizing the penile extremity is expected, there was no impediment to carrying out the examination. We believe that the patients' tactile ability, using both hands during urination, to manipulate their own penis and the device, was sufficient to overcome the lack of visualization.

Another question we tried to answer was in regard to the impact of cognitive changes when performing MIU. We know that men with cognitive deficits have greater difficulties in manipulating devices attached to the genitals, as in the case of the artificial urinary sphincter for incontinence. Ballantyne and colleagues report that patients with impaired cognition were more likely to report difficulty with artificial urinary sphincter use compared to those with normal cognition (39% vs. 9%,  $p = 0.01$ ) [16]. A recent review on the impact of cognitive impairment in urologic implants recommends that: "while data on the association between urologic implants and cognitive impairment are sparse, urologists can provide appropriate preoperative counseling (including recommending against implantation) and can provide closer postoperative monitoring" [17].

In this study we used the CFQ questionnaire as an instrument to measure patients' cognitive capacity. Even in patients with high CFQ scores, the MIU exam went smoothly, without compromising the analysis of the results. This discrepancy between the manipulation of genital implants and the urodynamic device, in patients with cognitive impairment, likely occurs due to the difference in complexity between these elements. The device that the patient holds adhered to the penis, during urination, is easy to handle and does not require much skill to keep it in place.

## Conclusion

Minimally invasive urodynamics is an excellent option for the diagnosis and therapeutic follow-up of intravesical obstruction in

men, even in patients with increased abdominal circumference or cognitive changes. We believe that more studies on this topic can help us to establish an increasingly safer diagnosis, significantly reducing the harmful consequences of more invasive tests.

## Acknowledgments

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## Conflict of Interests

None declared.

## Funding Statement

There was no funding for this study.

## Clinical Trial Registration Number

Not necessary since our study is not based on clinical intervention, but only on observational analysis.

## Ethics of Approval Statement

Study approval number by the local ethics committee: 74323617.5.0000.5377.

## Patient Consent Statement

Not applicable.

## Data Availability Statement

Not applicable.

## Permission to Reproduce Material from Other Sources

We do not use materials from other sources.

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