

Cough stress tests to diagnose stress urinary incontinence in women with pelvic organ prolapse with indication for surgical treatment

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Abstract

Aims: To evaluate the diagnostic ability of different cough stress tests (CSTs) in women with pelvic organ prolapse (POP), performed during outpatient urogynaecological exams.

Methods: Prospective, multicentre observational study involving women on waiting lists for POP surgery. With a subjectively full bladder, patients were asked to perform five different CSTs: without prolapse reduction ([a] standing, followed by [b] semilithotomy position); keeping semilithotomy position with prolapse reduced (by [c] posterior speculum, followed by [d] pessary); [e] standing again with the pessary in place. Primary outcome was positive CST in at least one of the five CSTs. Bladder volume was measured and symptoms of stress urinary incontinence (SUI) were detected by two validated questionnaires.

Results: A total of 297 women completed all CSTs and were included in the analyses. Mean (SD) age, parity, and body mass index were 64.8 (9.9) years, 2.7 (1.3) deliveries, and 26.6 (3.4) kg/m², respectively. In total, 99 women (33.3%) reported SUI symptoms. At least one positive CST was recorded in 152 patients (51.1%), and in 90 (59.2%) of these 152, a positive CST was observed only when POP was reduced (occult SUI). The CST was positive in 92 (92.9%) of the 99 patients with coexisting SUI symptoms and in 60 (30.3%) of the 205 asymptomatic patients. The percentage of patients with a positive CST was significantly lower when bladder volume was <200 mL vs ≥200 mL ($P = .046$).

Conclusions: The identification of urinary leakage cases with CSTs is best achieved using multiple different patient positions, different prolapse reduction methods, and bladder volumes ≥200 mL.

KEYWORDS

cough stress test, pelvic organ prolapse, stress urinary incontinence

1 | INTRODUCTION

Pelvic organ prolapse (POP) is frequently associated with urinary disorders, such as stress urinary incontinence (SUI), urgency/urgency urinary incontinence, and voiding dysfunction/urinary retention. The majority of women with POP and urinary incontinence have symptoms of mixed urinary incontinence.¹ These disorders may improve or resolve after POP surgery, with the level of success depending on patient characteristics and type of surgery.^{2,3} The cough stress test (CST) is recommended in the evaluation of female patients to identify the signs of SUI and is used as an outcome measure following SUI treatment. The patient coughs and is observed for urine loss synchronous with the cough. If the patient leaks with the onset of the cough and terminates with its cessation, the test is positive and confirms the presence of SUI.⁴ Recently, the International Continence Society (ICS) has provided guidance on the CST with the introduction of the ICS Uniform Cough Stress Test (ICS-UCST), and an ICS education module has been developed to standardize the performance and reporting of the CST used in the clinical and outcome assessment of women with urinary incontinence.⁵ When compared with multichannel urodynamic evaluations, the CST demonstrates good sensitivity and specificity for SUI.⁶⁻⁸

In women with POP, the presence of SUI may be masked due to mechanical urethral obstruction and a CST will only be positive when performed with POP reduction (a situation referred to as occult stress urinary incontinence [OSUI]).⁴ The means of reducing the prolapse will vary (speculum, pessary, and swab).^{4,9} Women with POP without symptoms of SUI in preoperative evaluation can develop SUI symptoms after POP surgery, and the risk for postoperative SUI in these continent women is higher when they test positive for OSUI.¹⁰ The prevalence of OSUI in preoperative assessment varies greatly (6%-83%) depending on the sample studied and on the CST method.¹¹⁻¹³ There is currently no consensus on whether or not to perform SUI surgery at the time of POP repair. However, a reduction in postoperative SUI in patients with previous SUI or OSUI has been documented when SUI surgery is added to prolapse surgery.¹⁴⁻¹⁷ In clinical practice, it is key to have the most robust information available to support the decision-making process regarding the type of POP surgery and its possible combination with SUI surgery.

Although the CST can be a reliable assessment for women with POP, there is no standardization. With the aim of the present study to shed some light on this regard, we analyzed the sign of SUI using a battery of CSTs, with and without prolapse reduction, to determine the most useful methodology to detect SUI in women with advanced POP suitable for surgery management.

2 | MATERIALS AND METHODS

The current investigation is a secondary analysis of data from the CIRPOP-IUE study (Urogynaecological Dysfunction in women with POP surgery. Impact of vaginal repair on SUI). The CIRPOP-IUE study was a prospective, multicentre observational study including women on the waiting list for prolapse surgery at 39 specialized pelvic floor units that were part of the GISPEM Group (Pelvic Floor Dysfunction in Women Investigation Group) in Spain.¹⁸ The study was designed to explore the pattern of urinary symptoms in women with advanced POP who undergo POP surgery. All participants had to be over 18 years old with symptomatic genital prolapse stage equal to or greater than II, according to IUGA-ICS terminology.⁴ Women with any previous POP or SUI surgery were excluded. Participants were recruited while attending a single outpatient clinic visit between July 2012 and March 2013, during which all the data used in the present analysis were collected. All participants were fully informed about the nature and objectives of the study before enrolment and gave their written informed consent. The study protocol was approved by the Clinical Research Ethics Committee of the Hospital Clinic i Provincial in Barcelona. The registration number for ethical approval is 2011/7037.

A routine urogynaecological assessment was performed with clinical history and a routine urogynaecological exam. It included a pelvic and vaginal exam, to assess vaginal trophism, stage and compartment of POP, urethral mobility, pelvic floor muscle function, and the presence of urinary tract infection (UTI) with test strip. According to the results of this exam, we excluded patients with isolated posterior POP (without apical and without anterior POP). If we detected UTI, we administered antibiotic treatment and delayed the urogynaecological exam and the CST until the UTI resolved.

Symptoms of SUI were evaluated separately with the corresponding questions of two validated symptom questionnaires: the Epidemiology of Prolapse and Incontinence Questionnaire (EPIQ) and the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF). A patient was considered to have symptoms of SUI if they gave a positive answer, in both questionnaires, to the specific questions about having leakage with effort (response "yes" to EPIQ item 26 [*Do you experience urine leakage related to activity, coughing, or sneezing?*] and ICIQ-UI SF item 6 [*When does urine leak?*], option 3 [*leaks when you cough or sneeze*], and/or option 5 [*leaks when you are physically active/exercising*]). The EPIQ was also informative of other urinary symptoms in our population.

There are no standardized CST guidelines for women with POP, so a practical CST methodology was proposed for implementation at outpatient urogynaecological clinics.

All patients had to have a subjectively full bladder (ie, an intense desire to urinate) at the start of testing and were given instructions on the testing procedure. They were asked to cough (maximum five coughs) in five different situations. The five different CSTs were performed consecutively and with the same sequence. The first and second CSTs were performed *without prolapse reduction*, the first standing and the second in a semilithotomy position. Staying in a semilithotomy position, the third and fourth CSTs were performed *with the prolapse reduced* (the third by a posterior speculum and the fourth with an appropriately sized ring pessary). Finally, the patient was asked to stand up again and the fifth CST was performed with the pessary in place. After the last CST, the total bladder volume was calculated based on the spontaneously voided urine volume plus the postvoid residual urine volume (obtained by transurethral catheter). The patient was considered to have a positive CST when urine loss was observed simultaneously with the cough in at least one of the five situations.

According to the questionnaire and CST data, patients were classified into three groups (≥ 1 positive CST + SUI symptoms [group 1]; ≥ 1 positive CST + no SUI symptoms [group 2]; no positive CST + no SUI symptoms [group 3]: see Appendix A). The sample size was estimated with a focus on group 2, given that a minimum number of patients were required to detect differences between the two predefined comparison groups: POP surgery alone vs POP surgery combined with SUI surgery. The results for this group 2 have been published previously.¹⁸

Demographic and clinical data were recorded by means of an electronic case report form and were exported to the data analysis and statistical software Stata 10.0 (Stata Corp LP).

A descriptive analysis was performed. Continuous variables were described using mean and standard deviation (SD), and categorical variables described by number and percentage. Association of the results of the CST and prevoid urine volume was assessed using the χ^2 test. A *P* value of less than .05 was considered statistically significant.

3 | RESULTS

The final CIRPOP-IUE population consisted of 360 women with advanced (stage \geq II) POP on the waiting list for surgery. In the preoperative assessment, 114 were classified in group 1, 87 in group 2, and 159 in group 3. A total of 297 women completed all five CSTs and were included in the analyses. Mean \pm SD age was 64.8 ± 9.9 years and mean body mass index (BMI) was 26.6 ± 3.4 kg/m². Patient characteristics at baseline are shown in Table 1. The vast majority of participants (98.3%) were parous and 97.1% had undergone a vaginal delivery (mean \pm SD: 2.7 ± 1.3). At the

TABLE 1 Patient characteristics at baseline (N = 360)

Variable			
Age, mean (SD), y	64.8 (9.9)		
BMI, mean (SD), kg/m ²	26.6 (3.4)		
Any vaginal delivery (n, % patients)	335 (93.0)		
Number of vaginal deliveries, mean (SD)	2.7 (1.3)		
Caesarean section (n, % patients)	17 (4.7)		
Number of caesarean sections, mean (SD)	1.1 (0.3)		
Menopause (n, % patients)	307 (85.2)		
Comorbidities (Item 14, EPIQ) (n, % patients)			
Urinary tract infection or bladder infections (more than 3 in a year)	89 (24.7)		
Diabetes	45 (12.5)		
Depression	81 (22.5)		
Lung diseases/asthma	29 (8.1)		
Neurological disease	14 (3.8)		
Urinary urgency (Item 21, EPIQ), n (%)	210 (58.7)		
UUI (Item 25, EPIQ), n (%)	138 (38.8)		
	Compartment		
POP stage, n	Anterior	Central	Posterior
Stage IV	63	48	13
Stage III	194	130	29
Stage II	73	112	58
Stage I	17	42	127
No prolapse	10	23	123

Note: Each patient could present prolapse in more than one compartment and at different stages.

Abbreviations: BMI, body mass index; EPIQ, epidemiology of prolapse and incontinence questionnaire; POP, pelvic organ prolapse; SD, standard deviation; UUI, urgency urinary incontinence.

initial visit, 96.9% of women reported the sensation of having a lump in the vagina or something protruding from the vagina. According to the POP classification, the majority of anterior and apical prolapses were classified as stage II-III, and the majority of posterior prolapses were classified as stage I-II (Table 1). When the evaluable sample was analyzed according to the presence of SUI symptoms, 99 (33.3%) out of 297 patients had SUI symptoms according to the EPIQ and ICIQ and the remaining 205 were asymptomatic for SUI. A positive CST in at least one situation was recorded in 152 (51.1%) of the 297 participants.

Among those women with a positive CST, the test with the fewest positive results (34.2%) was the one performed with no POP reduction in a semilithotomy position and the test with the most positive results (80.3%) was the one performed with POP reduction with a pessary in a semilithotomy position (Figure 1).

Analyzing the distribution of the total population according to the combination of SUI symptoms and CST, 20.2% of the 297 women had no SUI symptoms, but had a

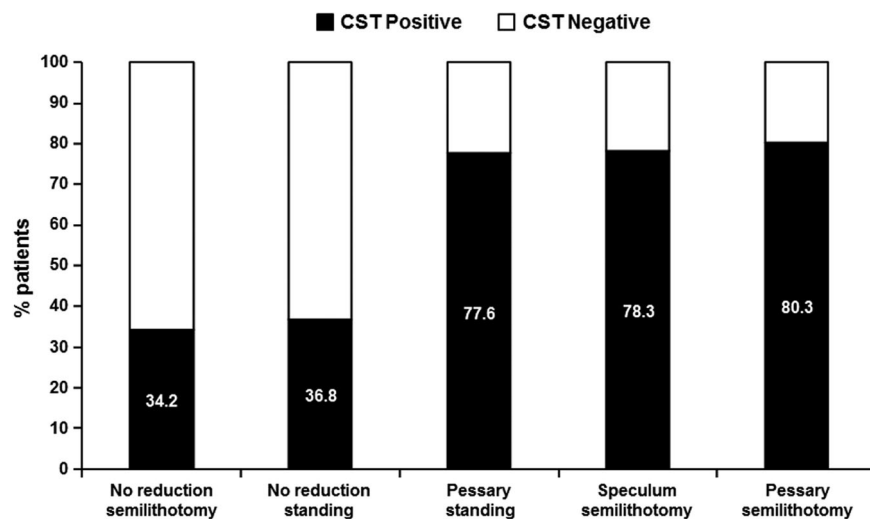


FIGURE 1 Distribution of patients according to CST position and outcome among women with at least one positive test. CST, cough stress test

positive CST, and 31.0% had both SUI symptoms and a positive CST; the remaining patients (48.8%) had no symptoms and no positive CST (see Appendix B).

Only half of the patients with POP and symptomatic SUI (46.7%-53.3%) had a positive CST when the POP was not reduced, and relatively few of the positive tests in asymptomatic patients (11.7%-15.0%) were observed using either of the CSTs without prolapse reduction (Table 2). At least 88.8% of the patients with a positive stress test were detected when considering two of the tests involving prolapse reduction, and 98% of the patients with a positive CST were detected when considering all three tests with prolapse reductions (Figure 2).

When the results of the CSTs were analyzed according to the absence or presence of SUI symptoms, 92 of the 99

TABLE 2 Distribution of patients with a positive CST in different positions and without and with POP reduction among women with at least one positive test

CST positions	Without SUI symptoms (n = 60)		With SUI symptoms (n = 92)	
	n	%	n	%
No reduction standing	7	11.7	49	53.3
No reduction semilithotomy	9	15.0	43	46.7
Speculum semilithotomy	45	75.0	74	80.4
Pessary semilithotomy	46	76.7	76	82.6
Pessary standing	47	78.1	71	77.2

Note: Data include all participants with at least one positive stress test from any of the five tests (n = 152).

Abbreviations: CST, cough stress test; POP, pelvic organ prolapse; SUI, stress urinary incontinence.

women with SUI symptoms (92.9%) demonstrated leakage with the full battery of CSTs, whereas only 60 of the 205 women without SUI symptoms had a positive CST (29.2%).

The median total bladder volume when the CST was performed was 270 mL (range, 32-930 mL). Total bladder volume was less than 200 mL in 25.8% of participants. The percentage of asymptomatic women with a positive CST was significantly lower when the total bladder volume was under 200 mL than that found for higher volumes, $P = .046$ (Table 3).

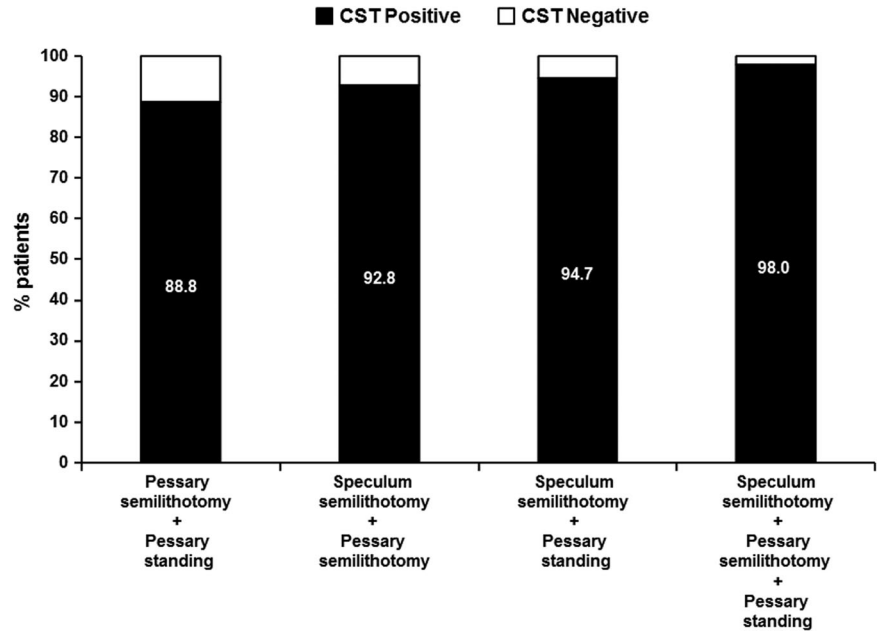
4 | DISCUSSION

This study evaluated the performance of a battery of CSTs, with and without prolapse reduction, to detect SUI signs in women with POP on waiting lists for POP surgery. One-third of the study group had accompanying SUI symptoms. The sign of SUI was demonstrated in half of the total sample with this battery of CSTs. We have demonstrated in this group of patients with severe POP, with or without accompanying SUI symptoms, that a clinical assessment based on a battery of CSTs is a reliable diagnostic tool to detect SUI preoperatively.

The proportion of the women with POP in the present study who reported symptoms of SUI preoperatively detected by validated questionnaires was also similar to that found in other studies in similar groups of patients with POP stage \geq II.¹⁹⁻²¹

The CST was positive when POP was not reduced in only half (46.7%-53.3%) of the patients with symptomatic SUI, and relatively few of the positive tests in asymptomatic patients (11.7%-15%) were observed using either of the CSTs without prolapse reduction. OSUI is defined by the ICS as “stress incontinence only observed after reduction of co-existent prolapse” (ie, in asymptomatic

FIGURE 2 Distribution of patients according to combinations of CST position (with POP reduction) and outcome among women with at least one positive test. CST, cough stress test; POP, pelvic organ prolapse



women).⁴ In our study, we evaluated the percentage of women, with or without symptoms of SUI, with a positive CST when the test was performed with and without POP reduction. We observed that when this test was performed without POP reduction, the percentage of women with a positive sign of SUI was notably lower than when the POP was reduced in any position. Therefore, according to the ICS definition of OSUI, the CST with POP reduction in patients with severe POP with indication for surgical treatment resulted in more positive cases than without POP reduction.

The CST was positive in at least one of the five situations in 60 (29.2%) of the 205 asymptomatic patients. These results are very similar to the OPUS trial,²² in which they performed preoperatively three different CSTs in women with stage ≥ II POP (semilithotomy position without POP reduction, same position with POP reduced, and standing with POP reduced) and found a positive CST in 111 of the 311 patients (33.6%) in the total study group. In the OPUS trial, they performed the CST by retrograde fill (300 mL). In our study, we decided to perform the CST with naturally filled bladder and when

patients felt a comfortable full bladder, as outpatient clinics often lack the facilities to perform the test with a retrograde filled bladder. The present study suggests that a battery of CSTs in women with a comfortably full bladder can also be useful to demonstrate SUI.

The results of our study may be limited by the fact that in some cases, the CST was performed with bladder volumes under 200 mL. The presence of urinary urgency and a decreased functional bladder capacity may have been impediments to achieving higher volumes. Nonetheless, this subgroup of patients helped us to identify a lower rate of detection of SUI with bladder volumes below 200 mL, and thus the importance of conducting a CST under optimal conditions. However, we acknowledge that not all clinical centers have the necessary resources to perform a retro fill before testing for OSUI. Based on our results, we suggest that it would be good clinical practice to evaluate the bladder volume by ultrasound before performing the CST and, if the volume estimated is under 200 mL, delay the test until the patient has a higher volume.

TABLE 3 Association of the result of the CSTs and total prevoid bladder urine volume for women with or without SUI symptoms

Stress test result	Without SUI symptoms				With SUI symptoms			
	Total	TBV < 200 mL	TBV ≥ 200 mL	P ^a	Total	TBV < 200 mL	TBV ≥ 200 mL	P ^a
Negative	105	33	72	.046	7	1	6	.541
Positive	40	6	34		65	16	49	
Total	145	39	106		72	17	55	

Note: Data refer to number of patients.

Abbreviations: SUI, stress urinary incontinence; Incontinence; TBV, total bladder volume.

^aχ² test.

In this study, we observed the importance of a standardized method for prolapse reduction and a battery of CSTs for preoperative detection of urinary leakage with effort (sign of SUI) in women with advanced POP. The CST performed with the POP reduced with a speculum in a semilithotomic position and then repeated with a pessary, both in semilithotomic position and standing, was the strategy that detected the highest number of patients with leakage upon effort, both in symptomatic and asymptomatic patients. We also observed that bladder volume during the CST plays an important role in the detection of SUI in asymptomatic women.

One of the main strengths of our study is its multicentre design. The study investigated a sample of women on waiting lists for prolapse surgery in 39 specialized centres, only excluding patients with previous pelvic surgery. This provides clinical and epidemiological information about the coexistence of POP with SUI signs and symptoms in routine clinical practice at a national level in Spain. Another strength of the study is the battery of five CST employed to identify SUI. It is notable that our study was performed in a Gynecological Unit setting, where it is difficult to perform retrograde bladder filling and to use a transurethral catheter. The CST was performed when women had a comfortable sensation of full bladder alongside the measurement of total bladder urine volumes (by ultrasound when possible) at the time the test was performed. These are important issues, since there is currently no standardized CST in women with POP.

5 | CONCLUSIONS

In women with advanced POP, with or without symptoms of SUI, the detection of leakage indicative of SUI was best achieved using a combination of CSTs with different methods of POP reduction, and detection was more likely in those women with higher bladder urine volumes when they have a sensation of full bladder.

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GISPEM GROUP

GISPEM (Grupo de Investigación en Disfunciones del Suelo Pélvico de la Mujer): Pelvic Floor Dysfunction in Women Investigation Group.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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