Can preoperative urodynamic studies predict de novo stress urinary incontinence following advanced pelvic organ prolapse surgery?

Kübra Keskin Toptas[1], Mustafa Goksu[2], Ozan Karadeniz[3], Deniz Noyan Özlü[4], Aysu Akca[5]

[1]Department of Gynecology and Obstetrics, Cam and Sakura City Hospital, Istanbul, Turkey; [2]Department of Gynecology and Obstetrics, Kanuni Sultan Suleyman Training and Research Hospital, Health Sciences University, Istanbul, Turkey; [3]Department of Gynecology and Obstetrics, Arnavutkoy State Hospital, Istanbul, Turkey; [4]Department of Urology, Bitlis State Hospital, Bitlis, Turkey; [5]IVF and Reproductive Genetics Centre, Memorial Sisli Hospital, Istanbul, Turkey

Cite as: Toptas KK, Goksu M, Karadeniz O, et al. Can preoperative urodynamic studies predict de novo stress urinary incontinence following advanced pelvic organ prolapse surgery? *Can Urol Assoc J* 2025;19(5):E183-8. http://dx.doi.org/10.5489/cuaj.8818

Published online January 14, 2025

ABSTRACT

INTRODUCTION: We aimed to assess the predictivity of preoperative urodynamics (UDS) on de novo stress urinary incontinence (SUI) in patients having advanced pelvic organ prolapse (POP).

METHODS: Between January 2016 and June 2019, 133 patients with symptomatic POP at stage 3 or higher were included in the study. The presence of postoperative SUI symptoms after a minimum of six months of followup was considered the primary outcome. The results of all patients' preoperative UDS were compared to their postoperative SUI symptoms. In addition, patients were divided into two groups based on whether SUI was detected during preoperative UDS testing (group 1) or not (group 2).

RESULTS: Although preoperative measurements, such as bladder capacity and residual urine volume, were not different between groups, group 1 had lower maximal urethral closure pressures (p=0.001). Preoperative SUI symptoms had a sensitivity of 32.1% and a specificity of 91.4% for predicting de novo SUI. In patients with advanced POP, preoperative UDS had a sensitivity of 60.7% and a specificity of 87.6% for predicting de novo SUI.

CONCLUSIONS: Urodynamic examination with a pessary can significantly predict the development of de novo SUI.

INTRODUCTION

Pelvic organ prolapse (POP) is a group of clinical pathologies that occur when one or more pelvic organs displace downward or forward from their normal position adjacent to the vaginal vault due to pelvic floor insufficiency. Displacement-induced deviations from normal function can result in a variety of symptoms. POP has a prevalence of 3–6% when defined by symptoms, and it can be up to 50% when defined by vaginal examination.[1] POP surgery is performed twice as frequently as incontinence surgery, with a prevalence ranging from 6–18%. The annual incidence of POP surgery ranges from 1.5–1.8 per 1000 women and peaks in women aged 60–69.[2]

Urinary incontinence (UI) is defined as the loss of urine that affects a woman's social life and can be objectively demonstrated.[3] The relationship between UI and age is well-characterized. The age-specific incidence of UI in women under 40 is <2 per 1000 person-years in all current studies, but it increases with age.[4] Age, gender, race, smoking, childbirth, sex hormones, menopause, medications, family history, previous pelvic surgery, pelvic prolapse, obesity, and chronic constipation have all been linked to the development of UI.[3,4]

UI and POP are frequently linked to gynecologic issues. This is because a common factor often causes most UIs and all POPs: pelvic floor insufficiency. Bladder neck hypermobility and stress urinary incontinence (SUI) are common in women with anterior compartment prolapse attached to

the anterior vaginal wall. Urethral obstruction increases as the degree of prolapse increases (stages III and IV), while symptoms of SUI decrease.[5]

Patients undergoing surgical correction of POP may experience urinary leakage. This is due to the prolapsed organ's support, which helps absorb the increased abdominal pressure and supports the urethra.[6] The loss of this support after prolapse surgery causes incontinence (de novo SUI). This study aimed to see how well preoperative urodynamic testing predicts de novo SUI in patients undergoing POP surgery.

METHODS

The Ethics Committee of the Health Sciences University Dr. Sadi Konuk Training and Research Hospital approved this retrospective cohort study (approval number KAEK/2019.25.10), and we followed the Helsinki Declaration's ethical guidelines. Prior to enrollment, all patients provided written informed consent. Patient data was obtained from the electronic medical database system and retrospectively screened from January 1, 2016, to June 1, 2019. A total of 191 patients, aged from 40–85, who underwent POP surgery of at least third-degree or higher, were identified. Patients with urge-predominant incontinence before prolapse surgery underwent preoperative urodynamic testing (UDS); those who experienced bladder injuries during surgery were excluded from the study. Additionally, patients with neurologic conditions, such as neurogenic bladder, Parkinson's disease, and multiple sclerosis, were also excluded.

When analyzing the data of 191 patients, it was discovered that records were absent for 20 patients. These patients could not be reached for postoperative followup because of inaccurate or invalid information. Consequently, they were not included in the study. Additionally, 11 patients were excluded from the study due to isolated urge incontinence.

Twenty-seven patients with preoperative symptoms of SUI chose to have anti-incontinence surgery at the same time as their POP surgery. All these patients had UDS that was consistent with SUI. In order to assess the postoperative results of preoperative UDS accurately, excluding the 27 patients, as mentioned earlier, a total of 133 patients were enrolled in the study (Figure 1).

All patients underwent preoperative procedures, including a medical history review, physical examination, complete urine analysis, urine culture, and UDS. The complex cytometry method was used to evaluate the patients' urodynamics at the Kanuni Sultan Suleyman Training and Research Hospital's urodynamic laboratory. The surgeries were performed by an experienced urogynecology team and the patients were followed by the same team in the urogynecology outpatient clinic (KKT, MG, OK, AA). Urodynamics were also interpreted by a single urogynecologist specialized in the subject (AA).

A total of 133 patients, aged 39–86, who had undergone vaginal hysterectomy, were invited to the urogynecology clinic for reevaluation six months to three years after the procedure. These patients did not have significant urge incontinence prior to the procedure and had not previously undergone anti-incontinence surgery.

Urge incontinence is defined as a complaint of involuntary loss of urine associated with urgency. SUI is defined as a complaint of involuntary leakage on effort or exertion or on sneezing or coughing.[3] In dorsal lithotomy, a stress test is performed by provoking incontinence with maneuvers that increase intra-abdominal pressure, such as coughing or straining, while the patient's bladder is full. Additionally, urethral hypermobility was tested by performing a Q-tip test. In the Q-tip test, the movement of the rod was measured during maximal straining using a sterile cotton rod: 30° and above was considered hypermobility.

Following their surgery, we contacted the study participants. At the urogynecology clinic, they were asked about their experience with UI during various activities, such as coughing, sneezing, standing, and lying down. Those who reported urinary leakage were classified as having postoperative de novo SUI symptoms. Patients were also asked about urge incontinence and urgency symptoms in order to classify them into SUI, urge, and mixed-type UI subgroups based on their symptoms. Individuals having mixed incontinence belong to the category where the primary aspect of urinary leakage

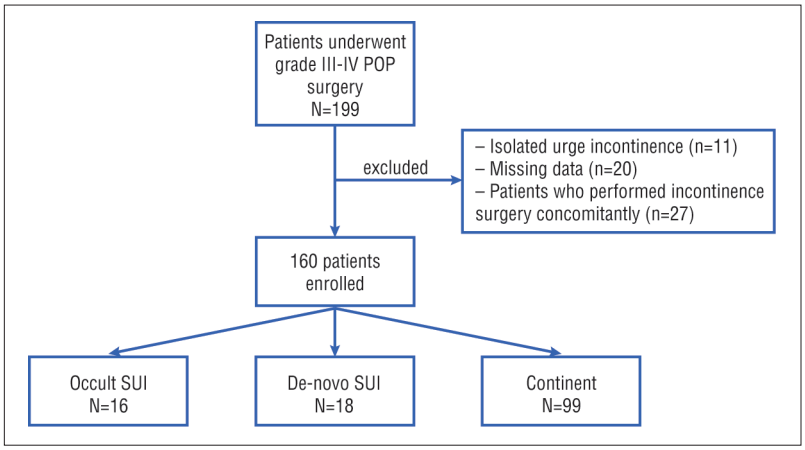

Figure 1. Flow chart diagram for patient selection and allocation. POP: pelvic organ prolapse; SUI: stress urinary incontinence.

is apparent. The patients were examined while they were in the dorsal lithotomy position.

Prior to the procedure, all patients underwent a UDS using the multichannel urodynamic device from Life-Tech, Inc., available at our clinic. Patients who had completely emptied their bladders underwent filling cystometry and urethral pressure profilometry (UPP) after undergoing pressure reduction using a pessary.

During cystometry, the infusion rate was adjusted to 30 ml/min with isotonic NaCl. The initial sensation (ml), bladder capacity (ml), and compliance (ml/cm H_20) were noted during bladder filling. Uninhibited detrusor contractions above 15 cm H_20 during filling were identified. Simultaneously, the presence of urinary leakage with increasing severity during coughing and straining was observed. If leakage occurred, the urinary leakage pressure (cm H_20 VLPP) value was recorded using the Valsalva maneuver.

A static UPP was used to measure functional urethral length and maximum urethral closure pressure (MUCP). In our study, normal UDS was defined as a VLPP >150 cm H_20 with no involuntary detrusor contractions. A VLPP of ≥100 cm H_20 was defined as SUI caused by proximal urethral hypermobility. Conversely, SUI due to intrinsic sphincter deficiency was indicated when VLPP <60 cm H_20. If VLPP was 60–100 cm H_20, it was assumed that both proximal urethral hypermobility and intrinsic sphincter deficiency contributed to the pathology.

Detrusor instability is an involuntary phasic contraction of the detrusor muscle (>15 cm H_2O) accompanied by a sense of urgency or urinary leakage.

The SPSS (Statistical Package for Social Sciences) for Windows 20.0 program was used for statistical analysis in evaluating the study findings. Descriptive statistical methods (mean, standard deviation, and frequency) were employed to assess the study data. The student's T-test was used to compare parameters with a normal distribution between the two groups, while the Mann-Whitney U test was used for parameters without a normal distribution. The Spearman correlation test was employed to examine the relationships between parameters, and the Chi-square test was used to compare qualitative data. Preoperative SUI symptoms were correlated with preoperative UDS and postoperative SUI symptoms. The results were assessed with a 95% confidence interval (CI) and a significance level of $p<0.$

RESULTS

The study retrospectively analyzed the demographics and patient characteristics of 133 individuals who had POP surgery from January 2016 to June 2019. The parameters include age, gravidity, parity, body mass index (BMI), mode of delivery, history of previous surgery, surgical indication, postoperative hospital stay, and preoperative UI.

Patients were divided into groups based on preoperative UI (solely SUI or mixed incontinence with SUI predominance). Information regarding preoperative incontinence surgery was provided to 18 patients with evident incontinence, but they declined the intervention. The number of patients with occult SUI (SUI observed after reduction with a pessary) was found to be 16. Both clinical and urodynamic evaluations were negative for 99 patients.

The demographic and clinical characteristics of the patients included in the study are presented in Table 1. When examining the demographic and clinical charac-

Table 1. Demographic and clinical characteristics of patients

Demographics	Allocated patients (N=133)
Age	62.2±9.4 (39–86)
Gravida	4.8±2.2 (1–12)
Parity	3.6±1.8 (1–11)
BMI	29.5±3.8 (19.1–38.4)
Menopause status, n (%)	
Premenopausal	31 (23.3)
Postmenopausal	102 (76.6)
Route of previous delivery, n (%)	
Vaginal	124 (93.2)
C/S	2 (1.5)
Vaginal + C/S	7 (5.2)
Indications for surgery, n (%)	
Descensus uteri + cystorectocele	121 (91)
Descensus uteri+ cystocele	12 (9)
Performed surgical procedures	
VAH + CA	15 (11.2)
VAH + CAP	60 (45.1)
VAH + CAP + SSF	57 (42.8)
VAH + colpocleisis	1 (0.8)
Hospitalization (days)	3.7±0.9
Postoperative followup (months)	13.3±6.6
Preoperative urinary incontinence:	
No SUI	99 (74.4)
Occult SUI	16 (12)
SUI	18 (13.5)

BMI: body mass ındex; CA: anterior colporrhaphy; CAP: anterior-posterior colporrhaphy; C/S: Cesarean section; SSF: sacrospinous fixation; SUI: stress urinary incontinence; VAH: vaginal hysterectomy.

Table 2. Comparison of demographic and clinical characteristics of patients based on preoperative urodynamics

Parameters	Detection of SUI during preoperative urodynamics		p
	Group 1 Yes (n=30)	Group 2 No (n=103)	
Age, mean ± SD	62.4±9.2	61.9±9.7	0.79
Gravity, mean ± SD	5.3±2.6	4.7±2.0	0.20
Parity, mean ± SD	3.4±1.9	3.6±1.7	0.63
BMI, mean ± SD	30.7±3.6	29.1±3.8	**0.04**
Postmenopausal patients, n (%)	24 (80)	78 (75)	0.62
Hospitalization (days), mean ± SD	3.6±1.0	3.6±0.9	0.53
Postoperative followup (months), mean ± SD	15.8±7.5	12.4±6.1	**0.01**

Bold values indicate statisical significance; BMI: body mass index; SD: standard deviation; SUI: stress urinary incontinence.

Table 3. Comparison of urodynamic parameters in patients with and without preoperatively detected SUI

Parameters	SUI detection during preoperative urodynamics		p
	Group 1 Yes (n=30)	Group 2 No (n=103)	
Bladder capacity (ml), mean ± SD	472.5±56	483.6±49	0.29
MUCP (mmHg), mean ± SD	60.8±26	77.3±23	**0.001**
Residual urine volume (ml), mean ± SD	7.8±28.6	11.0±41	0.63

Bold values indicate statistical significance. MUCP: maximal urethral closure pressure; SD: standard deviation; SUI: stress urinary incontinence.

Table 4. The diagnostic value of preoperative urodynamic assessment and the presence of preoperative symptoms in de novo SUI

	De novo SUI prediction	
	Preoperative symptoms	Urodynamics
Sensitivity	32.1%	60.7%
Spesifity	91.4%	87.6%
PPD	50%	56.6%
NPD	83.4%	83.4%

NPD: negative predictive value; PPD: positive predictive value; SUI: stress urinary incontinence

teristics based on patients' preoperative UDS results, no significant differences were observed in terms of age, gravida, parity, menopausal status, and length of hospital stay between the groups (Table 2). In the preoperative UDS assessment, patients without observed SUI had lower BMIs (30.7±3.6 vs. 29.1±3.8, p=0.04). Additionally, when comparing the time intervals for patients called for postoperative followup, the average duration for the 30 patients with preoperative stress urinary incontinence (SUI+) was 15.8 months, while the average duration for the 103 patients without SUI (SUI-) was 12.4 months, revealing a significant difference between the groups (p=0.01).

Patients with preoperative SUI have statistically significantly lower MUCP (mmHg) compared to those without SUI (p<0.01); however, no differences were observed in mean bladder capacities and residual urine volumes between the groups (Table 3).

The prediction of postoperative de novo SUI based on preoperative SUI symptoms showed a specificity of 91.4%, indicating a high ability to identify the symptom-free group. Similarly, the specificity of the UDS assessment was 87.6%; however, the sensitivity of preoperative symptom presence in predicting postoperative de novo SUI was considerably low at 32.1%, and urodynamic sensitivity was found to be 60.7% (Table 4).

When preoperative SUI symptoms and preoperative UDS findings are correlated with postoperative de novo SUI symptoms, a weak association with preoperative SUI symptoms is observed (Table 5); however, there is a moderately significant correlation with preoperative UDS findings.

DISCUSSION

Lower urinary tract symptoms are often associated with POP. The use of UDS before POP surgery varies considerably.[3,7-9] The main objective of this retrospective cohort study was to assess the importance of preoperative UDS in the evaluation, treatment, and monitoring of women who undergo POP surgery. Our findings indicate that preoperative UDS can predict postoperative de novo SUI with a sensitivity of 60.7% and a specificity of 87.6%.

Previous studies have reported higher sensitivity, specificity, positive predictive value and negative predictive value for the predictivity of UDS.[10] This could be attributed to the patients' lack of POP in those studies, as well as the comparison of definitive diagnoses based on abstract diagnoses made by doctors at the same hospital. We believe that the effects of prolapse on the vagina and bladder, the extent of improvement in postoperative cystocele, and age-related changes all influence the diagnostic accuracy of preoperative UDS, even after reduction with a pessary.

Around 20–30% (increasing to 80%) of patients who are continent and have occult SUI before POP surgery may experience incontinence even after the operation.[11,12] In our study, we identified 18 cases (13.5%) of SUI and 16 cases (12%) of occult SUI. These numbers are consistent with the existing literature. In the postoperative period, it was observed that 28 of 34 patients continued to experience symptoms of SUI, while six patients did not. Determining whether simultaneous prophylactic anti-incontinence surgery for SUI should be added or not will be guided by UDS evaluation, along with informing patients about the possibility of SUI after POP surgery.

The role of UDS evaluation in the preoperative assessment of patients with POP is significant. Performing a UDS evaluation before correcting prolapse in patients is important and proceeding with correcting prolapse using a suitable pessary is crucial.

Although patients with POP rarely complain of SUI, some of these women may have SUI but remain clinically continent.[13,14] This is because the bladder's kinking effect on the urethra due to a wide cystocele defect and the bladder's ability to absorb and support part of the increased intra-abdominal pressure act as a cushion, maintaining continence. As a result, the pressure in the urethra is higher than the pressure in the bladder, which ensures continence.

In 2011, The American College of Obstetricians and Gynecologists reported that there is limited data available for performing UDS testing before POP surgery.[15] Recently, a systematic review stated in its summary that UDS should be used in the clinical management of UI in adults; however, there is still insufficient evidence to support improved clinical outcomes.[16] This is because female lower urinary tract management is difficult.[17] The translation of theoretical knowledge into clinical application of these fundamental deficiencies is difficult due to uncertainty about the etiology of SUI, whether it is caused by an anatomical disorder or an intrinsic factor in the urethra.[18]

According to the International Continence Society (ICS), the UDS test can provide clinicians with objective information in cases of recurrent lower urinary tract symptoms.[19] It has been observed that during UDS interpretations by the ICS, there is an 80% agreement among experts in the diagnosis; however, Van Leijsen and colleagues stated in their study that UDS alone is insufficient to predict UI.[20] This situation may be attributed to the differences in urodynamic characteristics across different centers. Furthermore, these studies included patients with urge incontinence who frequently take anticholinergic drugs before surgery, and their bladder function may be impacted by these medications, potentially influencing the results of the studies. We did not include patients with urge incontinence in our study, which might have influenced the precision of UDS.

Table 5. Correlation between de-novo SUI symptoms and preoperative urodynamic findings and symptoms

	De novo SUI symptoms		Confidence interval
	R	p	
Preoperative urodynamic SUI	0.49	<0.001	0.34–0.60
Preoperative SUI symptoms	0.31	<0.001	0.15–0.45

SUI: stress urinary incontinence.

Hextall et al conducted tests using vaginal pessaries on patients with POP to provoke incontinence. Before undergoing prolapse surgery, UDS testing was scheduled for these women. The results indicated that 19 out of 70 patients had evidence of SUI. The authors emphasized the high sensitivity of UDS in detecting SUI, supporting its use before POP surgery.[21]

Patients undergoing POP surgery were subjected to preoperative and postoperative UDS examinations in a study conducted by Stanton et al. Urodynamic data revealed no notable change. The occurrence of detrusor instability and voiding challenges did not escalate.[22] In our study, we only conducted preoperative UDS on patients and compared them with postoperative symptomatic outcomes.

In 50% of women with POP who do not report SUI, there is hidden SUI. Patients with prolapse often exhibit urethral hypermobility due to pelvic floor insufficiency, and sphincteric insufficiency is frequently present.[23] Despite this, if the urethra is well-supported by the prolapsed organ, incontinence can be prevented; however, after surgical correction of prolapse, incontinence may occur in patients. In this study, we investigated the postoperative clinical assessment of patients who had undergone prolapse surgery with preoperative UDS. We excluded patients who had undergone anti-incontinence surgery and those with urge incontinence. The aim was to determine the correlation between UDS and postoperative clinical findings.

Limitations

The decision not to perform postoperative UDS was based on the study's retrospective nature and cost-effectiveness considerations; however, the most impor-

tant limitation of our study is its retrospective nature. Other important limitations are that SUI symptoms are not classified according to their severity and that their effect on quality of life is not examined in patients who develop de novo SUI.

The higher number of patients in our study may have contributed to the increased significance of UDS assessment. Additionally, it could be related to the specific UDS method employed in our clinic; however, relying solely on UDS to decide on surgery can sometimes result in excessive treatment. Voiding dysfunction and detrusor overactivity are the key factors to consider in this regard.[24]

In our study, MUCP was examined, but it should also be noted that the diagnostic accuracy of urethral pressure profilometry measurement in SUI is generally poor.[6] Since our study involved a retrospective review of data, no anti-incontinence surgery was performed simultaneously with the POP surgery. Additionally, patients who underwent anti-incontinence surgery were excluded from our study.

In addition to the study we performed, incorporating postoperative UDS enables the comparison of UDS with postoperative symptoms. Its sensitivity can be enhanced by using more advanced techniques in performing UDS, making it a valuable direct diagnostic test.

CONCLUSIONS

History and physical examination are insufficient to determine the type of incontinence and to select the appropriate medical or surgical treatment. As highlighted in numerous studies, a UDS evaluation is necessary for a precise diagnosis. In this study, we excluded patients who underwent UDS before prolapse surgery, patients who underwent anti-incontinence surgery, and patients with urge incontinence, and made a postoperative clinical evaluation of the patients to see whether the UDS were compatible with the postoperative clinic. In our data, the postoperative SUI prediction sensitivity of preoperative UDS was found to be 60.7% and its specificity was 87.6%. This shows us that UDS examination with a pessary can significantly predict the development of de novo SUI.

COMPETING INTERESTS: The authors do not report any competing personal or financial interests related to this work.

This paper has been peer reviewed.

REFERENCES

1. Nygaard I, Barber MD, Burgio KL, et al. Prevalence of symptomatic pelvic floor disorders in US women. *JAMA* 2008;300:1311-6. https://doi.org/10.1001/jama.300.11.1311
2. Barber MD, Maher C. Epidemiology and outcome assessment of pelvic organ prolapse. *Int Urogynecol J* 2013;24:1783-90. https://doi.org/10.1007/s00192-013-2169-9
3. Abrams P, Cardozo L, Wagg A, Wein A, editors. Incontinence 6th Edition. ICI-ICS. International Continence Society, Bristol, ISBN: 978−0956960733; 2017
4. Stewart WF, Hirsh AG, Kirchner HL, et al. Urinary incontinence incidence: Quantitative meta-analysis of factors that explain variation. *J Urol* 2014;191:996-1002. https://doi.org/10.1016/j.juro.2013.10.050
5. Petri E. Bladder dysfunction after radical surgery. In:Ostergaard DR. Gynecologic Urology and Urodynamics: Theory and practice. Balthimore, Williams and Wilkins, 545-55 (1985)
6. Colombo M, Maggioni A, Zanetta G, et al. Prevention of postoperative urinary stress incontinence after surgery for genitourinary prolapse. *Obstet Gynecol* 1996;87:266-71. https://doi.org/10.1016/0029-7844(95)00378-9
7. Winters JC, Dmochowski RR, Goldman HB, et al. Urodynamic studies in adults: AUA/SUFU guideline. *J Urol* 2012;188:2464-72. https://doi.org/10.1016/j.juro.2012.09.081
8. Whiteside JL. Making sense of urodynamic studies for women with urinary incontinence and pelvic organ prolapse: A urogynecology perspective. *Urol Clin N Am* 2012;39:257-63. https://doi.org/10.1016/j.ucl.2012.06.001
9. Hwang SM, de Toledo LGM, da Silva Carramão S, et al. Is urodynamics necessary to identify occult stress urinary incontinence? *World J Urol* 2019;37:189-93. https://doi.org/10.1007/s00345-018-2366-8
10. Kemahlı E, Aras B, Tuğcu V, et al. The diagnostic values of medical history, physical examination and urodynamic study in women with urinary incontinence. *American Research J Urol* 2017;1:1-9.
11. Kleeman S, Vassallo B, Segal J, et al. The ability of history and a negative cough stress test to detect occult stress incontinence in patients undergoing surgical repair of advanced pelvic organ prolapse. *Int Urogynecol J Pelvic Floor Dysfunct* 2006;17:27-9. https://doi.org/10.1007/s00192-005-1367-5
12. Brubaker L, Cundiff GW, Fine P, et al. Abdominal sacrocolpopexy with Burch colposuspension to reduce urinary stress incontinence. *N Engl J Med* 2006;354:1557-66. https://doi.org/10.1056/NEJMoa054208
13. Bump RC, Fantl JA, Hurt WG. The mechanism of urinary continence inwomen with severe uterovaginal prolapse: Results of barrier studies. *Obstet Gynecol* 1988;72:291.
14. Rosenzweig BA, Pushkin S, Blumenfeld D, et al. Prevalence of abnormal urodynamic test results in continent women with severe genitourinary prolapse. *Obstet Gynecol* 1992;79:539-42.
15. Urinary incontinence in women. ACOG practice bulletin; no. 63. Washington, DC: American College of Obstetricians and Gynecologists (ACOG); 2005
16. Glazener CM, Lapitan MC. Urodynamic investigations for management of urinary incontinence in adults. *Cochrane Database Syst Rev* 2002;3:CD003195. https://doi.org/10.1002/14651858.CD003195
17. Whiteside JL. Making sense of urodynamic studies for women with urinary incontinence and pelvic organ prolapse: A urogynecology perspective. *Urol Clin North Am* 2012;39:257-63. https://doi.org/10.1016/j.ucl.2012.06.001
18. Chai TC. Coining a new term-Urovesicology: Advancing towards a mechanistic understanding of bladder symptoms. *Transl Androl Urol* 2012;1:50-7.
19. Hosker G, Rosier P, Gajewski J, et al. Committee 6: Dynamic Testing. In: Abrams P, Cardozo L, Khoury S, et al, editors. Incontinence. Paris: Health Publications Ltd; 2009. p. 413
20. van Leijsen SA, Hoogstad-van Evert JS, et al. The correlation between clinical and urodynamic diagnosis in classifying the type of urinary incontinence in women. A systematic review of the literature. *Neurourol Urodyn* 2011;30:495-502. https://doi.org/10.1002/nau.21047
21. Hextall A, Boos K, Cardozo L, et al. Videocystourethrography with a ring pessary in situ. A clinically useful preoperative investigation for continent women with urogenital prolapse? *Int Urogynecol J Pelvic Floor Dysfunct* 1998;9:205-9. https://doi.org/10.1007/BF01901605
22. Stanton SL, Hilton P, Norton C, et al. Clinical and urodynamic effects of anterior colporrhaphy and vaginal hysterectomy for prolapse with and without incontinence. *Br J Obstet Gynaecol* 1982;89:459-63. https://doi.org/10.1111/j.1471-0528.1982.tb03637.x
23. Bump RC, Fantl JA, Hurt WG. The mechanism of urinary continence in women with severe uterovaginal prolapse: Results of barrier studies. *Obstet Gynecol* 1988;72:291-5.
24. Roovers JP, Oelke M. Clinical relevance of urodynamic investigation tests prior to surgical correction of genital prolapse: A literature review. *Int Urogynecol J Pelvic Floor Dysfunct* 2007;18:455-60. https://doi.org/10.1007/s00192-006-0260-1

CORRESPONDENCE: Dr. Deniz Noyan Özlü, Department of Urology, Bitlis State Hospital, Bitlis, Turkey; noyanozlu@hotmail.com