

A Comparative Study of Patient Experiences of Conventional Fluoroscopic and Four-Hour Ambulatory Urodynamic Studies

Seung-June Oh,¹ Ja Hyeon Ku,² Hwancheol Son,¹ and Jeong Yun Jeong³

Department of ¹Urology, Seoul National University College of Medicine, ²Seoul Veterans Hospital and ³Eulji University College of Medicine, Seoul, Korea.

We assessed several emotional variables in patients experiencing conventional urodynamic and ambulatory urodynamic monitoring (AUM) to verify the hypothesis that AUM is tolerated as well as conventional urodynamics. A total of 33 women and 7 men from 23 to 72 years of age who were undergoing both procedures were prospectively included in this study. Prior to and immediately after the procedures, each patient completed a self-administered questionnaire. Answers were given on a visual analogue scale. The degree of anxiety was higher for conventional urodynamics than for AUM ($p = 0.045$), while the degree of boredom experienced during AUM was higher than that during conventional urodynamics ($p = 0.013$). There was no significant difference in the degree of shame or bother experienced by the patients during the two procedures. In general, patients tolerated both examinations extremely well. The examiner-rated degree of intolerance during conventional urodynamics was influenced by the subjective pain score ($p = 0.001$), while all other emotional variables except bother were not significantly related with the degree of intolerance during AUM ($p = 0.007$). A total of 74.4% and 84.6% responded that they were willing to repeat conventional urodynamics and AUM, respectively, which were not significantly different. Although AUM produced a significantly higher level of boredom than conventional urodynamics, our data demonstrates that patients are as tolerant of AUM as they are of conventional urodynamic procedures.

Key Words: Urodynamics, ambulatory monitoring, detrusor instability, pain, anxiety

Received December 14, 2005

Accepted May 2, 2006

Reprint address: requests to Dr. Ja Hyeon Ku, Department of Urology, Seoul Veterans Hospital, 6-2 Doonchon-dong, Kangdong-gu, Seoul 134-791, Korea. Tel: 82-2-2225-1392, Fax: 82-2-483-4260, E-mail: randyku@hanmail.net

INTRODUCTION

Urodynamic investigations are a widely accepted tool for measuring functional lower urinary tract abnormalities.¹ Cystometry involves the measurement of intravesical pressure during the course of bladder filling and emptying. It is crucial that urodynamic test results reproduce the patient's presenting symptoms, and conventional cystometry has been widely used to identify specific bladder functions. However, the non-physiologic nature of conventional urodynamics (including bladder filling by rapid infusion through a catheter and monitoring in a laboratory setting) fails to provide a diagnosis in a significant proportion of patients.

Ambulatory urodynamic monitoring (AUM) has been presented as a more sensitive and reliable method of detecting and quantifying uninhibited detrusor contractions than standard cystometrograms in various patient groups²⁻⁵ based on conventional cystometric criteria. In contrast to conventional urodynamic studies, AUM allows the patient to be more independent than is possible with a fixed urodynamic apparatus. Therefore, this method allows the patient to perform those activities that he or she knows will reproduce the troublesome urinary symptoms.⁶ Moreover, bladder filling occurs in a natural way and is not artificially influenced. The test is thus considered to be more accurate than conventional cystometry because the physiologic processes are uninhibited.

Although most of the morbidities associated

with urodynamic procedures involve minor complications, patients perceive the procedure as traumatic and worrisome. Some patients regard a urodynamic study as an unpleasant and painful procedure. Even when the urodynamic study is performed properly, patients may still have a negative perception of the experience.

Although several studies have mentioned conventional urodynamic^{7,8} and AUM9-related morbidity, no study has addressed patients' pre-procedure perceptions or post-procedural experiences. The present prospective study was designed to compare patient experiences with conventional urodynamic studies and AUM to verify the hypothesis that AUM is as well tolerated as conventional urodynamic studies.

MATERIALS AND METHODS

Between November 2002 and August 2003, consecutive patients who had been referred for urodynamic assessments (including urinary urgency with or without incontinence) were recruited to our study. Approval for this study was obtained from the Internal Review Board of Seoul National University Hospital. Patients referred for this study who provided informed consent were eligible to participate. To be eligible, patients had to be at least 20 years of age or older, be able to complete a questionnaire, and have no previous experience with conventional urodynamic or ambulatory urodynamic monitoring. The exclusion criteria included ongoing infections, an indwelling catheter, an inability to cooperate, and an increased infection risk (e.g., previous heart valve reconstruction, a hip prosthesis, etc.). A total of 33 women and 7 men from 23 to 72 years of age (mean age plus or minus standard error, 47.4 ± 1.9) who were undergoing conventional video-urodynamics and AUM were included in the study on a prospective basis. Table 1 itemizes the patient demographics.

All procedures were performed on an outpatient basis. Each patient received a leaflet containing detailed information about the procedure a few days before the procedure took place. A midstream urine specimen was sent for microscopy and sensitivity testing immediately before

Table 1. Patient Characteristics

Patients (n)	40
Mean age (yr, range)	47.4 (23-72)
Gender (%)	
Male	7 (17.5)
Female	33 (82.5)
Level of education (%)	
Primary school or lower	13 (32.5)
Middle school	13 (32.5)
College or higher	14 (35.0)
Income (won)/month (%)	
< 1 million	8 (20.0)
1 - 2 million	15 (37.5)
> 2 million	17 (42.5)

Data are number of patients (%).

the investigation. Patients were assessed for pre-procedure anxiety prior to the studies. Conventional urodynamic studies (UD-2000, Medical Measurement System, Enschede, the Netherlands) were performed by one examiner in an identical manner for all patients. Each patient then underwent a free uroflow study and a video-urodynamic study (Ultravist, Schering AG, Berlin, Germany) with contrast-mixed normal saline at a filling rate of 50 mL/min using a dual-lumen single-use 6-French catheter (Medtronic Inc., Skovlunde, Denmark). Standard aseptic methods of catheterization were used. Immediately after the procedure, each patient completed a self-administered questionnaire.

After completing conventional urodynamics, patients then underwent AUM as described by the King's College Hospital Protocol.¹⁰ Briefly, the test lasted at least four hours. All transducers were zeroed to atmospheric pressure. An 8-French catheter (Unisensor, Attikon, Switzerland) was inserted urethrally with two pressure transducers in the bladder in order to detect artifacts. Another catheter-mounted microtransducer (Unisensor, Attikon, Switzerland) covered with a condom was inserted into the rectum. Pressures were recorded on a solid-state system (UPS-2020, Medical Mea-

surement System, Enschede, the Netherlands). Urinary leakage was detected using a conductance device. The participants voided on a flowmeter which was connected to a recorder. They were instructed to drink 180 ml of water every 30 min, and to complete a symptom and activity diary during the test. These instructions were carefully explained before the test started. Each participant was asked to note when an event such as urgency or urge incontinence occurred and to record the time using the clock on the display screen of the ambulatory recorder. At the end of each test, patients were asked to wash their hands to provoke urinary symptoms. Immediately after AUM, each patient completed the self-administered questionnaire as described above. The examiner also recorded the degree of patient pain and

patient tolerability.

The questionnaire was developed by an investigator (S.J.O.) and has been previously described.¹¹ It was developed primarily by experts and addressed items of interest, including pain, shame, bother, boredom, and intolerance. The content of the questionnaire was thoroughly reviewed and modified by three experts (J.H.K., Yeonsoon Ko, R.N. and Seung Hwa Lim, R.N.). Pilot testing and subsequent person-to-person interviews were conducted on five patients who had undergone a urodynamic study to ensure that the items on the questionnaire were relevant. Some of the questionnaire items were modified due to the feedback obtained. The print layout and arrangement of the questionnaire were designed to allow it to be easily read and answered

APPENDIX 1: STUDY QUESTIONNAIRE FOR PATIENTS

(Given before investigation)

1-1. Please rate the amount of anxiety you experienced in the period between knowing that you needed a urodynamic study until today.

(Given immediately after the investigation)

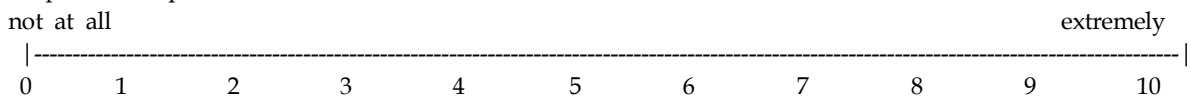
- 2-1. Please rate the amount of pain you experienced during the urodynamic study.
- 2-2. Please rate the amount of shame you experienced during the urodynamic study.
- 2-3. Please rate the amount of bother you experienced during the urodynamic study.
- 2-4. Please rate the amount of boredom you experienced during the urodynamic study.
- 2-5. If medically necessary, how willing would you be to return for this procedure?

APPENDIX 2: PATIENT RESPONSE AS RATED BY THE EXAMINER

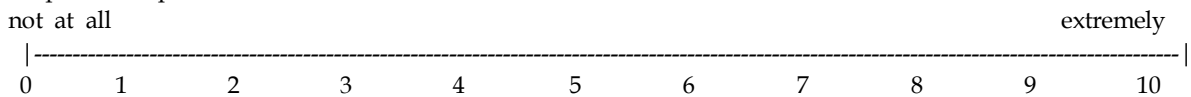
(Given immediately after the investigation)

- 3-1. Please rate the amount of pain the patient experienced during the urodynamic study.
- 3-2. Please rate the amount of tolerance shown by the patient during the urodynamic study.

Responses to questions 1-1, 2-1, 2-2, 2-3, 2-4, and 3-1:



Response to question 3-2:



Response to question 2-5:

- | | | |
|---------------|-----------------|---------------|
| a. not at all | b. nearly not | c. rather not |
| d. some | e. considerably | f. very much |

by patients. The questionnaire was then administered repeatedly at one-week intervals to the 10 patients who were followed-up at the Incontinence Clinic. Preliminary studies revealed that the questionnaire was valid and reliable. Answers were given on a visual analogue scale (VAS).¹² The distance from the left end of the scale was used to quantify the variable. The left end of the scale was defined as "not at all" and the right end as "extremely." Patients were also asked to indicate whether they were willing to repeat the examination. The response choices to this question were rated according to a six-point scale: i.e., "not at all," "nearly not," "rather not," "some," "considerably," and "very much" (Appendix 1). After the procedure, the examiner also noted the degree of patient pain and patient tolerability. Answers were given on a VAS as described above. The examiner rated the patient's cooperation from "excellent" at the left end of the scale to "extremely poor" on the right end of the scale (Appendix 2).

VAS measures were analyzed using group means as continuous variables. The Mann-Whitney U test was used to assess the differences between these continuous variables. Correlations of the degree of pain reported by the patient and the examiner were performed using the Spearman correlation test. The influences of a patient's emotional state and the patient's intolerance were explored using a multiple linear regression analysis. A stepwise

method was used to select the explanatory variables based on the analysis of variance. The level of statistical significance was defined as $p < 0.05$ and all statistical tests were 2-sided. Results are presented as the mean plus or minus the standard error, unless otherwise indicated.

RESULTS

Table 2 shows the mean and median levels for each variable, together with the range.

The effects of demographics on each emotional variable during conventional urodynamics are shown in Table 3. Sex, age and educational level did not have a significant effect on the variables. However, as income increased the degrees of bother ($p = 0.008$) and boredom ($p = 0.011$) during conventional urodynamics decreased.

Table 4 shows the effect of patient demographics on each variable during AUM. The patients' pre-procedural anxiety was not significantly different with respect to sex, age, educational level or income. With regard to gender and educational level, no significant differences were observed with respect to the degree of pain, shame, bother or boredom experienced during the procedure. In terms of age, the degree of bother experienced by patients 50 years of age or older was higher (5 versus 2.5, $p = 0.030$) than those less

Table 2. Distribution of Scores of Variables during Conventional and Ambulatory Urodynamics

Variables*	Conventional UDS			Ambulatory UDS		
	Mean	Median	Range	Mean	Median	Range
Patients response						
Anxiety	3.3	3.0	1.0 - 6.0	2.8	3.0	1.0 - 4.0
Pain	3.8	4.0	1.0 - 6.0	3.6	4.0	1.0 - 7.0
Shame	4.2	4.0	0.0 - 10.0	3.8	3.0	0.0 - 8.0
Bother	3.2	3.0	0.0 - 9.0	3.8	3.5	0.0 - 8.0
Boredome	3.1	2.0	0.0 - 9.0	4.7	5.0	0.0 - 9.0
Examiner grading						
Pain	4.0	4.0	1.0 - 7.0	4.0	4.0	1.0 - 7.0
Intolerance	2.2	3.0	0.0 - 5.0	2.2	2.0	0.0 - 7.0

*Possible score range is from 0 (not at all) to 10 (extremely).
UDS, urodynamic studies.

Table 3. Effects of Demographics on Each Variable During Conventional Urodynamics

	Patients grading					Examiner grading	
	Anxiety	Pain	Shame	Bother	Boredom	Pain	Intolerance
Sex							
Male	3 (1 - 5)	5 (1 - 6)	2 (0 - 8)	2 (0 - 9)	0 (0 - 9)	4 (2 - 5)	3 (2 - 5)
Female	3 (1 - 6)	4 (1 - 6)	5 (0 - 10)	3 (0 - 7)	3 (0 - 9)	4 (1 - 7)	2 (0 - 5)
<i>p</i> *	0.697	0.055	0.067	0.670	0.215	0.983	0.063
Age							
< 50	3 (1 - 6)	4 (1 - 6)	3 (0 - 10)	2 (0 - 7)	2 (0 - 9)	4 (1 - 7)	2 (0 - 5)
≥ 50	3 (2 - 6)	4 (1 - 6)	5 (0 - 10)	4 (0 - 9)	3 (0 - 10)	4 (2 - 6)	2 (1 - 5)
<i>p</i> *	0.426	0.426	0.512	0.106	0.156	0.202	0.967
Education							
≤ Middle school	3 (1 - 6)	4 (2 - 6)	3.5 (0 - 10)	3 (1 - 8)	2 (0 - 7)	4 (2 - 6)	2.5 (1 - 5)
High school	3 (1 - 6)	4 (1 - 4)	4 (0 - 8)	2 (0 - 6)	3 (0 - 6)	4 (2 - 6)	2 (0 - 3)
≥ College	3 (2 - 5)	4 (1 - 6)	5 (0 - 10)	2.5 (0 - 9)	3 (0 - 9)	4 (1 - 7)	2 (1 - 5)
<i>p</i> †	0.741	0.664	0.805	0.837	0.665	0.914	0.205
Monthly income							
< 1 million won	3.5 (3-6)	4 (2 - 6)	5 (2 - 8)	5.5 (4 - 8)	6 (3 - 7)	4 (2 - 7)	2.5 (1 - 5)
1 - 2 million won	3 (1 - 6)	4 (1 - 6)	5 (0 - 10)	2 (0 - 9)	2 (0 - 9)	4 (2 - 7)	2 (0 - 5)
> 2 million won	3 (2 - 4)	4 (1 - 6)	3.5 (0 - 10)	2 (0 - 5)	2 (0 - 5)	4 (1 - 6)	2 (0 - 4)
<i>p</i> †	0.127	0.920	0.640	0.008	0.011	0.736	0.591

*Mann-Whitney U test.

† Kruskal-Wallis test.

Data presented are medians (range).

than 50 years old. In addition, as income increased, the degree of pain ($p = 0.016$), bother ($p = 0.013$) and boredom ($p = 0.010$) decreased. Other emotional aspects were not significantly different according to age and income.

Table 5 shows the mean levels of each variable for conventional video-urodynamics and AUM. The patient pre-procedural level of anxiety was significantly different ($p < 0.05$), and the degree of anxiety was higher for conventional urodynamics than for AUM ($p = 0.045$). However, the degree of boredom experienced during conventional urodynamics was lower than that experienced with AUM ($p = 0.013$). Other parameter values including pain, shame and bother, as well as the examiner's measurements (the degree of patient pain and patient tolerability) were found to not be

significantly different for the two tests.

A significant correlation was found between the subjective pain score and the severity of pain as assessed by the examiner for both conventional urodynamics ($r = 0.563$, $p < 0.001$) and AUM ($r = 0.586$, $p < 0.001$). In general, patients tolerated the examinations extremely well. By using the step-wise method described earlier, the subjective pain score alone influenced the examiner-rated degree of intolerance during conventional urodynamics ([intolerance] = $0.418[\text{pain}] + 1.590$; $r = 0.498$, $p = 0.001$), while all other emotional variables except bother were not significantly related to the degree of intolerance during AUM ([intolerance] = $0.244[\text{bother}] + 1.233$; $r = 0.394$, $p = 0.007$).

In response to the question of "If medically necessary, how willing would you be to return for

Table 4. Effects of Demographics on Each Variable During Ambulatory Urodynamic Monitoring

	Patients grading					Examiner grading	
	Anxiety	Pain	Shame	Bother	Boredom	Pain	Intolerance
Sex							
Male	4 (3 - 6)	4 (1 - 5)	2 (1 - 8)	2 (0 - 7)	1 (0 - 8)	4 (2 - 7)	2 (1 - 7)
Female	4 (3 - 5)	4 (1 - 7)	4 (0 - 8)	4 (0 - 8)	5 (0 - 9)	4 (1 - 6)	2 (0 - 4)
<i>p</i> [*]	0.707	0.442	0.192	0.246	0.246	0.986	0.271
Age							
< 50	4 (3 - 6)	4 (1 - 6)	3 (0 - 8)	2.5 (0 - 8)	2.5 (0 - 9)	4 (1 - 6)	2 (0 - 3)
≥ 50	4 (3 - 5)	4 (1 - 7)	4 (0 - 8)	5 (0 - 7)	6 (1 - 9)	4 (2 - 7)	2 (0 - 7)
<i>p</i> [*]	0.379	0.325	0.366	0.030	0.084	0.234	0.065
Education							
≤ Middle school	4 (3 - 6)	4 (1 - 4)	2 (0 - 8)	4 (0 - 7)	5 (0 - 9)	4 (2 - 6)	2 (0 - 6)
High school	4 (3 - 5)	4 (1 - 7)	2 (0 - 8)	5 (0 - 7)	4 (1 - 8)	4 (3 - 6)	2 (0 - 4)
≥ College	4 (3 - 5)	4 (1 - 6)	4.5 (0 - 8)	3 (0 - 8)	5 (0 - 9)	4 (1 - 7)	2.5 (0 - 7)
<i>p</i> [†]	0.876	0.493	0.502	0.627	0.987	0.427	0.417
Monthly income							
< 1 million won	4 (3 - 4)	4 (4 - 7)	4.5 (2 - 8)	6 (3 - 8)	7 (3 - 9)	4 (4 - 6)	2 (1 - 6)
1 - 2 million won	4 (3 - 6)	4 (1 - 5)	3 (0 - 8)	4 (0 - 7)	6 (0 - 9)	4 (2 - 7)	2 (0 - 7)
> 2 million won	4 (3 - 5)	2 (1 - 6)	3 (0 - 8)	3 (0 - 6)	3 (0 - 7)	4 (1 - 6)	2 (0 - 5)
<i>p</i> [†]	0.311	0.016	0.381	0.013	0.010	0.160	0.809

*Mann-Whitney U test.

† Kruskal-Wallis test.

Data presented are medians (range).

Table 5. Comparison of Each Variable

Variables*	Conventional UDS	Ambulatory UDS	<i>p</i> [†]
Patient response			
Anxiety	3.0 (1.0 - 6.0, 3.3 ± 0.2)	3.0 (1.0 - 4.0, 2.8 ± 0.2)	0.045
Pain	4.0 (1.0 - 6.0, 3.8 ± 0.2)	4.0 (1.0 - 7.0, 3.6 ± 0.2)	0.430
Shame	4.0 (0.0 - 10.0, 4.2 ± 0.4)	3.0 (0.0 - 8.0, 3.8 ± 0.4)	0.444
Bother	3.0 (0.0 - 9.0, 3.2 ± 0.4)	3.5 (0.0 - 8.0, 3.8 ± 0.4)	0.225
Boredom	2.0 (0.0 - 9.0, 3.1 ± 0.4)	5.0 (0.0 - 9.0, 4.7 ± 0.4)	0.013
Examiner rating			
Pain	4.0 (1.0 - 7.0, 4.0 ± 0.2)	4.0 (1.0 - 7.0, 4.0 ± 0.2)	0.941
Intolerance	3.0 (0.0 - 5.0, 2.2 ± 0.2)	2.0 (0.0 - 7.0, 2.2 ± 0.2)	0.743

*Possible score range is 0 (not at all) to 10 (extremely).

† Mann-Whitney U test.

Data presented are medians (range, mean ± standard error).

UDS: urodynamic studies.

this procedure?", a total of 74.4% and 84.6% responded with either "some," "considerably" or "very much" for conventional urodynamics and AUM, respectively. No patient chose the alternative of "not at all" for AUM, while 7.7% did for conventional urodynamics; patients' willingness to repeat the procedure was not significantly different.

DISCUSSION

A significant proportion of physicians and patients are concerned about the level of discomfort associated with urodynamic studies. However, although morbidities such as urinary tract infection and urinary symptoms after conventional urodynamic studies^{6,7} and AUM⁸ have been studied, no report exists in the literature to date concerning the emotional aspects of urodynamic studies. In the present study, we attempted to obtain detailed data enabling the quantitative evaluation of a patient's experience with conventional urodynamic studies and AUM using a questionnaire including a VAS. We gathered data on six categories including anxiety, pain, shame, bother, boredom, and intolerance.

The simple VAS proved to be a useful and valid measure of anxiety.¹³ Most patients awaiting an elective procedure experience anxiety,^{14,15} which is influenced by the uncertainty concerning the impending procedures, past experience, and the patient's coping style.¹³ Although Domar et al.¹⁵ suggested that anxiety was not correlated with the type of procedure, age or occupation of the patient, or with previous experience, other investigators have reported that age,¹⁶ sex¹⁶⁻¹⁸ and previous experience¹⁹ have significant impacts on anxiety. Therefore, we hypothesized that if patients awaiting a urodynamic study experience a high degree of anxiety, this difference should also be detectable by using a VAS since our patients had no prior experience with urodynamic studies. In the present study, despite the finding that patients showed more anxiety before a conventional urodynamic study than before AUM, the anxiety scores of patients awaiting a urodynamic study were low. These findings suggest that anxiety awaiting a minor procedure may differ from that

associated with a major procedure.

Patients often experience discomfort, especially urethral pain, after a urodynamic study. In our study, 29 (75.6%) patients had a pain score of three or more, but no patient had a pain score greater than seven during conventional urodynamics. During AUM, 28 (70.0%) had a pain score of three or more and one patient reported a pain score of greater than seven. A significant correlation was found between the subjective pain score and the severity of pain as assessed by the examiner for both conventional urodynamics and AUM. Pain scores did not tend to correlate with pre-procedure anxiety scores in either study. We found that some demographics had an influence on emotional variables during conventional urodynamics and AUM. Interestingly, patients with higher incomes had lower bother and boredom scores during both conventional urodynamics and AUM. These findings suggest that the socioeconomic status of patients may play a role in the patient's emotions.

AUM differs from conventional urodynamics in terms of the equipment used, the type of urethral catheter, the bladder filling rate, the filling medium used, and the length of the test. All these factors may influence the discomfort that is associated with the procedure. The acceptability of the AUM may be due to the technique itself, during which patients are fully clothed and leakage is detected rather than visualized by the investigator. However, in this study many patients found both conventional urodynamics and AUM acceptable. Theoretically, any duration of monitoring may be used, but the potential benefits need to be offset against the disadvantages, which include discomfort and boredom for the patient. Thus, the time required for both conventional urodynamics and AUM may influence this finding, since the AUM takes longer.

It would be of value for physicians to recognize factors that influence the tolerability and successfulness of urodynamic studies. We analyzed the effects patients' emotions on their tolerance of urodynamic studies. In the current study, we evaluated patient tolerance using a questionnaire, and included both patient and examiner assessments. We found that patients with higher pain scores tended to lack tolerance for conventional

urodynamic studies, while those with a high bother score showed intolerance to AUM, although most patients tolerated the procedures well and there was no difference among patients in terms of technical difficulty. In the present study, we assessed the same patients' experiences with the two procedures. This enabled us to compare the results and reduce individual variance. However, the potential limitation of the present study is that both procedures were not conducted in a random sequential manner, and this may have introduced a source of bias, especially in terms of the assessment of anxiety.

In the present study, although randomization has not taken place, conventional urodynamics showed a significantly higher level of anxiety than AUM, while the latter showed a significantly higher level of boredom than conventional study. Nonetheless, our data demonstrate that both conventional urodynamics and AUM are well tolerated.

ACKNOWLEDGEMENTS

We thank Yeonsoon Ko, R.N., Mr. Kwi-Shik Kim, Seung Hwa Lim, R.N., and Ji Young Song, R.N. for their devoted efforts.

REFERENCES

- Bai SW, Kang SH, Kim SK, Kim JY, Park KH. The effect of pelvic organ prolapse on lower urinary tract function. *Yonsei Med J* 2003;44:94-8.
- Van Waalwijk van Doorn ES, Remmers A, Janknegt RA. Conventional and extramural ambulatory urodynamic testing of the lower urinary tract in female volunteers. *J Urol* 1992;147:1319-25.
- Webb RJ, Ramsden PD, Neal DE. Ambulatory monitoring and electronic measurement of urinary leakage in the diagnosis of detrusor instability and incontinence. *Br J Urol* 1991;68:148-52.
- Robertson AS, Griffiths CJ, Ramsden PD, Neal DE. Bladder function in healthy volunteers: ambulatory monitoring and conventional urodynamic studies. *Br J Urol* 1994;73:242-9.
- Heslington K, Hilton P. Ambulatory monitoring and conventional cystometry in asymptomatic female volunteers. *Br J Obstet Gynaecol* 1996;103:434-41.
- Van Waalwijk van Doorn E, Anders K, Khullar V, Kulseng-Hanssen S, Pesce F, Robertson A, et al. Standardisation of ambulatory urodynamic monitoring: Report of the Standardisation Sub-Committee of the International Continence Society for Ambulatory Urodynamic Studies. *Neurourol Urodyn* 2000;19:113-25.
- Porru D, Madeddu G, Campus G, Montisci I, Scarpa RM, Usai E. Evaluation of morbidity of multi-channel pressure-flow studies. *Neurourol Urodyn* 1999;18:647-52.
- Logadottir Y, Dahlstrand C, Fall M, Knutson T, Peeker R. Invasive urodynamic studies are well tolerated by the patients and associated with a low risk of urinary tract infection. *Scand J Urol Nephrol* 2001;35:459-62.
- Anders K, Cardozo L, Ashman O, Khullar V. Morbidity after ambulatory urodynamics. *Neurourol Urodyn* 2002;21:461-3.
- Radley SC, Rosario DJ, Chapple CR, Farkas AG. Conventional and ambulatory urodynamic findings in women with symptoms suggestive of bladder overactivity. *J Urol* 2001;166:2253-8.
- Ku JH, Kim SW, Kim HH, Paick JS, Son H, Oh SJ. Patient experience with a urodynamic study: a prospective study in 208 patients. *J Urol* 2004;171:2307-10.
- Revill SI, Robinson JO, Rosen M, Hogg MI. The reliability of a linear analogue for evaluating pain. *Anesthesia* 1976;31:1191-8.
- Kindler CH, Harms C, Amsler F, Ihde-Scholl T, Scheidegger D. The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concerns. *Anesth Analg* 2000;90:706-12.
- Badner NH, Nielson WR, Munk S, Kwiatkowska C, Gelb AW. Preoperative anxiety: detection and contributing factors. *Can J Anaesth* 1990;37(4 Pt 1):444-7.
- Domar AD, Everett LL, Keller MG. Preoperative anxiety: is it a predictable entity? *Anesth Analg* 1989;69:763-7.
- Grabow L, Buse R. Preoperative anxiety-anxiety about the operation, anxiety about anesthesia, anxiety about pain? *Psychother Psychosom Med Psychol* 1990;40:255-63.
- Shevde K, Panagopoulos G. A survey of 800 patients' knowledge, attitudes, and concerns regarding anesthesia. *Anesth Analg* 1991;73:190-8.
- Van Wijk MG, Smalhout B. A postoperative analysis of the patient's view of anesthesia in a Netherlands' teaching hospital. *Anaesthesia* 1990;45:679-82.
- Shafer A, Fish MP, Gregg KM, Seavello J, Kosek P. Preoperative anxiety and fear: a comparison of assessments by patients and anesthesia and surgery residents. *Anesth Analg* 1996;83:1285-91.