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Pad Weight Testing in the Evaluation of Urinary Incontinence

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Aim: To present the teaching module "Pad Weight Testing in the Evaluation of Urinary Incontinence." This teaching module embodies a presentation, in combination with this manuscript. This manuscript serves as a scientific background review; the evidence base made available on ICS website to summarize current knowledge and recommendations. **Methods:** This review has been prepared by a Working Group of The ICS Urodynamics Committee. The methodology used included comprehensive literature review, consensus formation by the members of the Working Group, and review by members of the ICS Urodynamics Committee core panel. **Results:** The pad test is a non-invasive diagnostic tool for urinary incontinence. It is an easy to perform, inexpensive test with utilization in both the daily patient care and clinical research. Despite it is clear value in initial diagnosis, selection of treatment, and follow-up evaluation, only less than 10% of urologists perform the test routinely. A number of testing protocols with varying lengths of recording time exist, however, only a 1-hr pad test has been standardized. One-hour pad tests are most suitable in establishing initial diagnosis, the 24-hr test serves most often for evaluation of treatment outcomes, and longer pad tests are used in clinical studies. **Conclusions:** The pad test is clearly underutilized. Well-designed studies providing level one evidence are lacking. Numerous variations in how the test is performed by individual urologists make the evaluation of published literature difficult. Future research goals should include randomized studies leading to establishment of optimal protocols of testing for clinical research and daily care. *Neurourol. Urodynam. 33:507–510, 2014.*

Key words: diagnostics; ICS teaching module; urinary incontinence; urodynamics; pad weight test

INTRODUCTION

Pad testing is a non-invasive method of detecting and quantifying severity of urine leakage. The 4th International Consultation on Incontinence defined pad testing as "an optional test for evaluation of urinary incontinence."[1] Diverse testing durations have been reported in the literature and only for the 1-hr pad test a specific test protocol has been standardized.[2,3] Although it is generally believed that longer tests are more reproducible, evidence on the accuracy of different methods of pad testing is inconsistent. A 24-hr test is more reproducible then a 1-hr test, but longer testing requires more preparation and a greater commitment on the part of the patient. Twenty-four-hour testing is reported to be adequate in routine clinical settings while 48- to 72-hr testing is deemed necessary for clinical research.[2,4]

MATERIALS AND METHODS

This review has been prepared by a Working Group of The ICS Urodynamics Committee. The methodology used included comprehensive literature review, consensus formation by the members of the Working Group, and review by members of the ICS Urodynamics Committee core panel.

The ICS Urodynamics Committee presents the teaching module "Pad Weight Testing in the Evaluation of Urinary Incontinence" to serve as a standard education of Good Urodynamic Practice for everyone involved in indicating, performing and analyzing urodynamic testing in general and more specifically, performing analysis of voiding. The teaching module consists of a presentation, in combination with this manuscript. This manuscript serves as a scientific background review; the evidence base, for the ICS Power Point presentation; available via http://www.icsoffice.org/eLearning/ or via the QR code on this page. The presentation explains, testing requirements, clinical workup and analysis. The presentation and this manuscript contain experts' opinion where evidence is, especially for the clinical practice aspects, unavailable and is marked" with: "eo" (experts opinion).

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RESULTS

Preparation

(1) *Test selection*: The type of pad test selected is based on goals. A 1-hr test is usually administered during initial evaluation to select treatment and estimate prognosis for cure (*eo*). Twenty-four-hour or longer testing is necessary for quantifying the degree of urine leakage (*eo*).
(2) *Instruction*: Detailed instruction is critical in order to elicit the full compliance of patients.
(3) *Filling the bladder to a set starting volume*: The short duration pad test (1-hr or less) may be performed using an instilled starting bladder volume. Usually, the bladder is filled through a urethral catheter (or during cystoscopy). Most reported studies used 150–300 ml, some recommend a volume equivalent to 50–75% of the functional bladder capacity.[5,6] Filling to the first desire to void or sensation of fullness has also been reported.[7] Although studies have documented that this modification improves the quantitative value of the test, the consensus on the ideal starting volume is lacking.[3]

Technique

The test is administered in a same manner to both male and female patients (*eo*).

One-hour pad test. The testing protocol has been standardized by International Continence Society (ICS-pad test):

-the test is started by putting one pre-weighted pad without patient voiding,
-patient drinks 500 ml of sodium-free liquid in <15 min—then sits or rests,
-patient walks for 30 min, including climbing one flight of stairs (up and down),
-patient performs the following activities: standing up from sitting (10×), coughing vigorously (10×), running on the spot for 1 min, bending to pick up an object from the floor (5×), and washing hands in running water for 1 min (this activity program may be modified according to the patient's physical fitness),
-the total amount of urine leaked is determined by weighing the pad.

If a moderately full bladder cannot be maintained through the hour (if the patient must void), the test has to be started again.

Twenty-four-hour pad test.
-the test should be started with an empty bladder,
-normal daily activities should be followed and recorded in a voiding diary so that the same schedule will be observed during follow-up re-testing (*eo*),
-to avoid urine loss trough leakage or evaporation the pads should be worn inside waterproof underpants and exchanged every 4–6 hr during daytime,
-pads should be weighed immediately. If weighing is performed at the clinic, pads must be stored in airtight bag.

Interpretation

The upper limit of weight increase for the 1-hr test in continent women is 1.4 g (equivalent to 1.4 ml) and 1.3–4.4 g for 24-hr test. These values may increase in situations of increased perspiration.[8] In the analysis of 1-hr pad test, an increase of 1–10 g is classified as representing mild incontinence, 11–50 g moderate and >50 g severe incontinence. The values for 24-hr pad test are classified as follows: Mild (4–20 g/24 hr), moderate (21–74 g/24 hr), and severe (>75 g/24 hr) incontinence.[9]

A weight gain of less than 1.4 g during 1-hr test or 4.4 g for 24-hr test could be a result of sweating or vaginal discharge. If the findings are inconclusive, oral phenazopyridine which colors the urine orange could be used.[10] Listed cut-off values are based on studies performed in female patients. The values specific to males have not been yet determined.

The outcomes of studies which attempted to correlate the volume of leakage to the etiology (stress, urge, and mixed incontinence) showed significant variability, suggesting that the pad test is not appropriate for separating the types of incontinence based on their etiology.[11,12] Ryhammer et al. compared weight gain between two groups of randomly selected women, 79 of whom reported continence and 38 reported incontinence. They found no difference in the outcome of 24-hr pad test, suggesting that pad test should not be used as a screening tool.[13] The sensitivity and specificity of the 1-hr pad test reported in the literature varies significantly.[14] The 1-hr pad test was shown to have a high positive predictive value, however the false positive results can occur in more then 50% of cases.[15]

Recommendations

-in the initial patient work-up, an objective measure of incontinence loss volume such as the pad test may help in treatment selection (e.g., male sling vs. artificial sphincter in the treatment of the post-prostatectomy incontinence) (Table I),[16]
-estimation of treatment prognosis (patients with high volume incontinence may experience lower cure rates) (*eo*),
-objective measure of treatment outcome for anti-incontinence procedures,
-the volume of leakage does not always correlate with the degree of bother (e.g., 2 g of urine leakage, which is roughly equivalent to 40 drops, produces a large spot on the clothing), therefore pad tests should be always interpreted in conjunction with history, clinical examination and self-assessment questionnaires (*eo*),
-future research goals should include determination of the optimal technique and duration of testing for both clinical and research purposes with the ultimate goal of developing an appropriate individualized testing protocol for patients and their varying circumstances (*eo*).

One-hour pad test.
-the 1-hr pad test, using the ICS standardized protocol is appropriate in routine evaluation of patients during initial work up,

TABLE I. Basic Characteristics and Degree of Accuracy of Individual Types of Pad Tests

	Short-term tests (qualitative assessment)	Long-term tests (quantitative assessment)
Bladder filling	No artificial filling or retrograde filling	No artificial filling
Physical activity during test	Standardized activities	Normal daily activities
Evaluation	Weight gain >1 g	Weight gain >4 g/24 hr
Sensitivity	34–83%[22]	Insufficient data
Specificity	65–89%[22]	Insufficient data

-if either the patient or physician have doubts about the accuracy of the initial test, evaluation should be extended by an additional hour or repeated,
-the test should always be interpreted in conjunction with standard self-assessment questionnaires including the bother index,
-performing the test with a known start volume might increase the accuracy, but the data supporting this assumption is inconclusive and there is no consensus on what the volume should be (*eo*).

Twenty-four-hour pad test.

-it is more reproducible than 1-hr test,
-highly dependent on patient compliance and therefore not suitable for all patients (*eo*),
-detailed instruction and patient motivation are important,
-the test results depend on fluid intake, physical activity levels, hormonal status, sexual activity, and environmental factors (temperature, humidity),
-the protocol should be personalized based on patient's physical status (*eo*),
-the physical activity and detailed voiding diary should be recorded so that a similar protocol is followed during the initial and all follow-up (*eo*).

DISCUSSION

Pad weighing as a diagnostic method for incontinence was first described by James et al. in 1971.[17] In 1981, Sutherst et al. were the first to publicize the use of the pad test with a prescribed set of activities and exercises.[18] Since then, a number of published studies used various forms of the pad testing protocols. Pad testing is easy and inexpensive, yet recent surveys of the Society for Urodynamics and Female Urology members showed that only 4.5–8% of the members perform the pad test routinely in their practice.[19] A number of studies have documented that the longer the testing, the better the correlation between the test results and the degree of incontinence. However, 24- to 72-hr pad tests are cumbersome and require high levels of patient compliance.[15,20] Test outcomes are affected by many factors and therefore have to be interpreted in combination with other methods of evaluation. Caution has to be exercised especially in giving too much weight to a negative 1-hr pad test (*eo*). Repeated short term testing is recommended especially in cases where the test result does not correlate with subjective assessment provided by the patient.[21] Good correlation has been reported by Abdel-Fattah et al.[22] between the self-assessment questionnaires and the 1-hr pad test. The King's Health Questionnaire showed a 96% sensitivity and 93% specificity of a 1-hr pad test in identifying incontinent patients.[22] The good correlation between self-assessment questionnaires and 1-hr pad test, but not the 24-hr pad test supports the value in standardization. Good correlation with the 24-hr pad test and the International Consultation on Incontinence Questionnaire—Short Form (ICIQ-SF) has been documented.[23] The biggest cost associated with the pad testing is the office visit, therefore home pad tests using the mail has been proposed.[24] Longer testing protocols could potentially increase the sensitivity and specificity, however, they require selection of highly motivated patients. The type of pad, leak, and evaporation could affect the outcome, therefore pad should be exchanged every 4–6 hr during the 24-hr and longer pad testing.[25]

CONCLUSIONS

The pad test is non-invasive and easy to perform, yet factors such as embarrassment and behavioral changes to reduce incontinence severity (inactivity, fluid restriction) could affect the outcome significantly. The 1-hr pad test as standardized by ICS is currently the only tool with a set protocol, and we recommend using the original protocol. In the case that artificial bladder filling is used, the bladder should be filled to 50–75% of its functional capacity prior to the initiation of the test. The 24-hr test is sufficient in daily clinical practice. Performing this test in conjunction with a voiding diary, or simply recording fluid intake and frequency of incontinence episodes, will significantly increase its utility. A standard protocol for 24- to 72-hr pad testing does not exist at the present time, and we believe establishing one would be very helpful. Prescribing specific physical activity over 24–72 hr is problematic, therefore we recommend instructing the patient to follow a normal daily routine. Despite the above limitations, the pad test provides objective assessment of involuntary urine loss. Its optimal utility depends upon understanding the impact of these limitations for diagnostic and prognostic use. The correlations of specific testing protocols with subjective and objective measures must be performed so that the most appropriate testing protocol may be employed according to circumstance. We believe that standardization of testing is an important first step in improving the utilization of this simple and inexpensive testing method.

REFERENCES

1. Abrams P, Andersson KE, Birder L, et al. Fourth International Consultation on Incontinence Recommendations of the International Scientific Committee: Evaluation and treatment of urinary incontinence, pelvic organ prolapse, and fecal incontinence. Neurourol Urodyn 2010;29:213–40.
2. Persson J, Bergqvist CE, Wolner-Hanssen P. An ultra-short perineal pad-test for evaluation of female stress urinary incontinence treatment. Neurourol Urodyn 2001;20:277–85.
3. Andersen JT, Blaivas JG, Cardozo L, et al. Seventh report on the standardisation of terminology of lower urinary tract function: Lower urinary tract rehabilitation techniques. International Continence Society Committee on Standardisation of Terminology. Scand J Urol Nephrol 1992;26:99–106.
4. Tennstedt S. Design of the Stress Incontinence Surgical Treatment Efficacy Trial (SISTEr). Urology 2005;66:1213–17.
5. Wu WY, Sheu BC, Lin HH. Twenty-minute pad test: Comparison of infusion of 250 ml of water with strong-desire amount in the bladder in women with stress urinary incontinence. Eur J Obstet Gynecol Reprod Biol 2008; 136:121–5.
6. Jakobsen H, Vedel P, Andersen JT. Objective assessment of urinary incontinence: An evaluation of three different pad-weighing tests. Neurourol Urodyn 1987;6:325–30.
7. Lose G, Rosenkilde P, Gammelgaard J, et al. Pad-weighing test performed with standardized bladder volume. Urology 1988;32:78–80.
8. Figueiredo EM, Gontijo R, Vaz CT, et al. The results of a 24-h pad test in Brazilian women. Int Urogynecol J 2012;23:785–9.
9. O'Sullivan R, Karantanis E, Stevermuer TL, et al. Definition of mild, moderate and severe incontinence on the 24-hour pad test. BJOG 2004;111:859–62.
10. Wall LL, Wang K, Robson I, et al. The Pyridium pad test for diagnosing urinary incontinence. A comparative study of asymptomatic and incontinent women. J Reprod Med 1990;35:682–4.
11. Matharu GS, Assassa RP, Williams KS, et al. Objective assessment of urinary incontinence in women: Comparison of the one-hour and 24-hour pad tests. Eur Urol 2004;45:208–12.
12. Fantl JA, Harkins SW, Wyman JF, et al. Fluid loss quantitation test in women with urinary incontinence: A test-retest analysis. Obstet Gynecol 1987;70:739–43.
13. Ryhammer AM, Laurberg S, Djurhuus JC, et al. No relationship between subjective assessment of urinary incontinence and pad test weight gain in a random population sample of menopausal women. J Urol 1998;159: 800–3.
14. Costantini E, Lazzeri M, Bini V, et al. Sensitivity and specificity of one-hour pad test as a predictive value for female urinary incontinence. Urol Int 2008;81:153–9.
15. Versi E, Orrego G, Hardy E, et al. Evaluation of the home pad test in the investigation of female urinary incontinence. Br J Obstet Gynaecol 1996;103:162–7.
16. Kumar A, Litt ER, Ballert KN, et al. Artificial urinary sphincter versus male sling for post-prostatectomy incontinence-what do patients choose? J Urol 2009;181:1231–5.

17. James ED, Flack FC, Caldwell KP, et al. Continuous measurement of urine loss and frequency in incontinent patients. Preliminary report. Br J Urol 1971;43:233–7.
18. Zimmern P, Kobashi K, Lemack G. Outcome measure for stress urinary incontinence treatment (OMIT): Results of two society of urodynamics and female urology (SUFU) surveys. Neurourol Urodyn 2010;29:715–8.
19. Victor A, Larsson G, Asbrink AS. A simple patient-administered test for objective quantitation of the symptom of urinary incontinence. Scand J Urol Nephrol 1987;21:277–9.
20. Sutherst J, Brown M, Shawer M. Assessing the severity of urinary incontinence in women by weighing perineal pads. Lancet 1981;1: 1128–30.
21. Soroka D, Drutz HP, Glazener CM, et al. Perineal pad test in evaluating outcome of treatments for female incontinence: A systematic review. Int Urogynecol J Pelvic Floor Dysfunct 2002;13:165–75.
22. Abdel-Fattah M, Barrington JW, Youssef M. The standard 1-hour pad test: Does it have any value in clinical practice? Eur Urol 2004;46:377–80.
23. Karantanis E, Fynes M, Moore KH, et al. Comparison of the ICIQ-SF and 24-hour pad test with other measures for evaluating the severity of urodynamic stress incontinence. Int Urogynecol J Pelvic Floor Dysfunct 2004;15:111–6.
24. Flisser AJ, Figueroa J, Bleustein CB, et al. Pad test by mail for home evaluation of urinary incontinence. Neurourol Urodyn 2004;23:127–9.
25. Karantanis E, O'Sullivan R, Moore KH. The 24-hour pad-test in continent women and man: Normal values and cyclical alterations. BJOG 2003;110:567–71.