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Pad Test by Mail for Home Evaluation of Urinary Incontinence

Adam J. Flisser,[1]* Johanna Figueroa,[2] Clifford B. Bleustein,[2] Georgia Panagopoulos,[3] and Jerry G. Blaivas[3,4]

[1]*Obstetrics and Gynecology, Mount Sinai School of Medicine, New York, New York*
[2]*Department of Urology, Montefiore Medical Center, Bronx, New York, New York*
[3]*Lenox Hill Hospital, New York, New York*
[4]*Joan and Sanford Weill College of Medicine, Cornell University, New York, New York*

Aims: To present a simple, cost-effective, and convenient method of home pad test using the mail system and evaluating change in pad weight over time. **Materials and Methods:** A series of nine kinds of commonly available commercial brands of urinary incontinence pads ranging from thin liners less than 10 g in dry weight to large diapers weighing over 100 g each were assembled. Two or three of each variety were individually weighed on an OHAUS LS2000 Portable Standard scale accurate to +/− 1 g. The pads were then wet uniformly with 20 cc of saline, placed individually in sealable plastic bags, sealed, and reweighed. Random groups of three pads were mailed by standard 1st class mail to the Urocenter of New York. The sealed pads were reweighed at 8 and 14 days from the original wetting. Concurrently, ten incontinence pads soiled with urine were similarly examined to confirm that there would be no detectable difference between urine and saline for the purpose of the study. In the second part of the study, 20 pads of the same type (13 inch-long pads with absorbent gel) were divided into 4 groups of 5 pads; each group was uniformly wet with 5, 10, 20, or 50 g of saline. These pads were mailed and reweighed at 7 and 14 days from the initial wetting. **Results:** Twenty-four pads were used in the first part of the study. The dry weights of 22/24 (92%) of the pads were within 2 g of the average weight for their brand. At the first reweighing, 22 pads (92%) weighed within 2 g of their initial wet weights (Fig. 1). Only two pads on day 8 differed substantially from their initial weights: one pad appeared to have lost 4 g and another one 9 g. On day 14, 23/24 pads remained within 1 g of their day 8 weight and 1 differed by 2 g, and the total weight of the 24 pads on day 14 was only 4 g different from their initial weight ($P = 0.71$, Fig. 1). The soiled pads exhibited weight changes that were indistinguishable from the saline pads. The average cost of mailing the pads by 1st class mail was $4 and the average length of time in the mail was 5 days +/− 1 day. In the second part of the study, 18/20 pads had lost less than 1 g at 1 week, and at 2 weeks, 19/20 had lost less than 2 g when compared to their initial weights (Fig. 2). One pad had lost 3 g. Pads in the low volume groups (5 and 10 g) lost an average of 1.4 and 1.2 g, respectively, while pads in the high volume groups (20, 50 g) lost an average of 1.8 and 2 g at 2 weeks. **Conclusions:** Dry pads of any single brand have a relatively standard weight that varies insignificantly between pads. Up to 2 weeks of delay in the weighing of individually sealed pads does not significantly affect the clinical measurement of weight at a variety of low (5 g) or high (50 g) volumes of simulated incontinence. Home pad test using the mail system is a feasible, inexpensive, and clinically accurate method of evaluating incontinence. Patients can be instructed in techniques for home pad test, allowing for greater compliance, and convenience for both physicians and patients. *Neurourol. Urodynam. 23:127–129, 2004.* © 2004 Wiley-Liss, Inc.

Key words: incontinence; objective outcome; pads

INTRODUCTION

Pad tests, formally described by Sutherst et al. [1981] and Walsh and Mills [1981] in 1981, are frequently incorporated into the evaluation and monitoring of urinary incontinence during diagnosis and therapy. A recent systematic review of the clinical literature by Soroka et al. [2002] examined 81 studies incorporating pad testing both in a clinical setting and at home; the authors found a wide variety of methodologies and usage of testing. A number of different pad test designs are in use, incorporating different durations (generally 1–72 hr), degrees of activity (i.e., normal activity or exercise-associated), and invasiveness (non-invasive or those performed at specific bladder volumes).

The utility of a medical test rests in a combination of factors, including the value of the information it will provide, the risks of performing the test, the cost of the test, and the

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*Correspondence to: Adam J. Flisser, MD, The Urocenter of New York 445 East 77th Street New York, NY 10021. E-mail: ajflisser@hotmail.com
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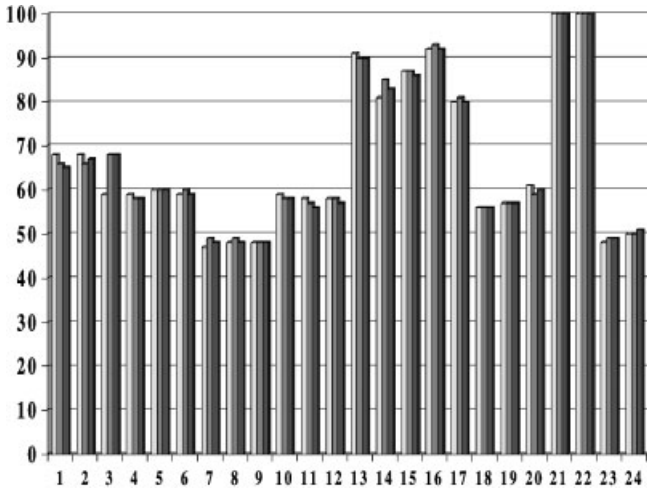

Fig. 1. Initial Day 7 and Day 14 weights of the 24 pads used in the first part of the study, in grams.

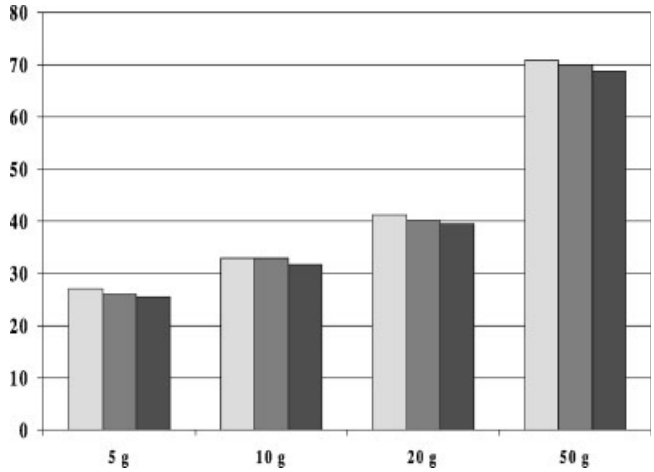

Fig. 2. Initial and two subsequent weights of pads in the 5, 10, 20, and 50 g wettings after one and two weeks.

ability of the patient to comply with the test's requirements. A pad test performed while a patient is occupied with their normal daily activities is generally easy for the patient to complete, inexpensive and risk-free, and can provide the physician with reliable, objective information about a patient's incontinence. The major cost associated with the pad test is the time associated with an office visit and the minimal time needed to determine the weight of the pads. In this study we examine the effect of time and the mail system on home pad testing, following the example of Versi et al. [1996].

MATERIALS AND METHODS

The study consisted of two phases: in the first phase, a series of nine kinds of urinary incontinence pads including several commonly available commercial brands as well as several generic store brands were assembled. Two or three of each variety were individually weighed on an OHAUS LS2000 Portable Standard scale accurate to $+/-$ 1 g. The pads were then wet uniformly with 20 cc of saline. These pads were placed individually in plastic bags, sealed, and reweighed. The weights were recorded, the pads were assembled randomly into groups of three, placed in standard manila mailing envelopes, and mailed by standard 1st class mail to the Urocenter of New York. Seven days later the envelopes were opened and the sealed pads were reweighed. Following this, the pads were again reweighed 14 days from the original wetting. Concurrently, 10 incontinence pads soiled with urine were similarly weighed and reweighed to confirm that there would be no detectable difference between urine and saline for the purpose of the study. In the second phase, the methodology was identical except that 20 pads of a single type were assembled into 4 groups and each group was wet with 5, 10, 20, or 50 ml of saline. Repeated measures analysis of variance was used to compare the weights of the pads, followed by the Bonferroni test in cases that appeared statistically significant.

RESULTS

Twenty-four pads were used in the first part of the study. The dry weights of 22/24 (92%) of the pads differed <2 g from the average for their brand. At the first reweighing, 22 pads (92%) weighed within 2 g of their initial wet weights, and of these 8 (36%) weighed exactly the same. Ten pads (45%) differed by 1 g, within the margin of error, and five pads (23%) weighed within 2 g of their initial wet weight. Only two pads on day 8 differed substantially from their initial weights: one pad appeared to have lost 4 g and the other 9 g. The total weight of all 24 pads on day 8 was 12 g higher than their initial weight, a non-significant difference ($P = 0.33$). On day 14, 23/24 pads remained within 1 g of their day 8 weight and 1 differed by 2 g, and the total weight of the 24 pads on day 14 was only 4 g different from their initial weight ($P = 0.71$). The average cost of mailing the pads by 1st class mail was \$4 and the average length of time in the mail was 5 days. In the second part of the study, 18/20 pads had lost less than 1 g at 1 week, and at 2 weeks 7/20 had lost less than 1 g and 12/20 had lost less than 2 g when compared to their initial weights. Pads in the low volume groups (5 and 10 g) lost an average closer to 1 g at 2 weeks while pads in the high volume groups (20 and 50 g) lost closer to 2 g at 2 weeks. Due to the overall consistency of the pad weights, the overall weight changes were statistically significant ($P < 0.023$ for the change at 1 week, $P < 0.001$ at 2 weeks), though not clinically significant in either case.

DISCUSSION

Physicians pursuing a reproducible and objective method of measuring urinary loss have long employed pad tests of various lengths and designs. At the same time, the practice of modern medicine is inescapably tied to cost-benefit analysis, and if clinical effectiveness can be maintained while containing costs, patients and clinicians both stand to benefit. This study describes a valid method also explored by Versi et al.

[1996] and Karantanis et al. [2003] that reduces the cost associated with office visits while maintaining the highest standard of objective medical relevance. It is limited in that we did not yet employ this test clinically, leaving open the possibility that patient compliance and/or execution of the test would be different in practical use than in this simulated test.

In clinical practice we have employed a 24-hr pad test in which patients remove and seal each pad as it becomes soiled, returning to have pads weighed against a dry pad as a standard; this is based in part on our experience in a multicenter study [Groutz et al., 2000a] that examined voiding diaries and pad tests over a 1–3 day period, finding reliability with 24, 48, and 72 hr pad tests but decreasing patient compliance with length. Simons et al. [2001] recently observed that 1-hr pad tests at similar bladder volumes did not exhibit test-retest reliability, in contrast to Persson et al. [2001]. Victor et al. [1987] observed that pad tests repeated in 46 women within 6–28 days of testing had a correlation coefficient of 0.66 for 24-hr pad tests, and a correlation of 0.90 for 48-hr pad test, while Versi et al. [1996] thought 24- and 48-hr tests were only marginally different with respect to reliability, and further confirmed that pads wetted with saline showed less than 5% change in weight after 8 weeks, with the upper 95% confidence limit of less than 10% loss. Ryhammer et al. [1999] reviewed the use of home and office pad tests and noted that pad tests performed at home are generally more reliable than office-based tests. We concur with the observations of these authors that pad tests should be performed in conjunction with "systematic registration of the participant's voidings, fluid intake and episodes of incontinence," and agree that without this context, a numerical value representing pad weight gain is substantially less useful in a clinical setting.

For the purpose of clinical outcomes research, we divide patients into clinical groups based on their pad test, with <8 g/24 hr considered normal, 9–20 g moderate incontinence, and >20 g severe incontinence [Groutz et al., 2000b]. Based on this stratification, the minor variations in pad weight over time would be unlikely to have clinical or research significance.

The US Postal Service [2003] uses nine hazard classifications to stratify dangerous or potentially dangerous materials in the mail stream, including explosives (Class 1), gases (Class 2), and flammable liquids (Class 3). Sealed incontinence pads fall under Class 6, Toxic Substances and Infectious Substances into Division 6.2, "Infectious substances [including] . . . clinical (diagnostic) specimens, biological products, sharps medical waste, and other used medical waste [that] are permitted to be mailed within specific quantity limits and packaging conditions." Under this section, "Clinical Specimens (e.g., a urine or blood specimen used in drug-testing programs or for insurance purposes) and biological products (e.g., polio vaccine), which include only those substances that are not known or not reasonably believed to contain an infectious substance (etiologic agent) . . . must be sent as Express Mail, Priority Mail, or First-Class Mail."

Given that delay in weighing does not significantly affect pad weight, we believe that the use of a home pad test in conjunction with appropriate labeling and packaging for the US Postal Service is a valid objective clinical method of monitoring urinary incontinence. Apart from a large change in two pad weights, which we attributed to weighing error or equipment failure, the results of this technique closely parallel the results expected from conventional, validated types of pad testing.

CONCLUSIONS

The type of incontinence pad used for pad testing is not significant, as almost all pads tested were insignificantly different from their standards. Delay in weighing of sealed pads does not significantly affect the clinical measurement of urinary loss, either with low (5 g) or high (50 g) volumes of fluid. Home pad test is a feasible, inexpensive, and clinically accurate method of evaluating incontinence. Patients can be instructed in techniques for home pad test, allowing for greater compliance and convenience for both physician and patients.

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