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Strong correlation between standing cough test and 24-hour pad weights in the evaluation of male stress urinary incontinence

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Abstract

Aims: We sought to compare in-office physical exam findings via standing cough test (SCT) versus 24-hour pad weights among men seeking treatment for postprostatectomy stress urinary incontinence (SUI).

Methods: A retrospective review of a single surgeon database of incontinence procedures was performed. Documentation of SUI severity (grades 0-4) was completed by SCT preoperatively utilizing the Male Stress Incontinence Grading Scale (MSIGS). All patients had pads per day (PPD) and 24-hour pad weights obtained. We determined the Spearman's correlation coefficient between these variables.

Results: We identified 104 men who underwent anti-incontinence surgery (AdVance Sling or artificial urinary sphincter [AUS]). In the sling group (65 patients), nearly all (97%) had minimal incontinence with SCT (MSIGS = 0-2). In the AUS group (39 patients), most patients (69%) had an MSIGS 3 or 4 with SCT. Spearman's coefficient between quantification of SCT and pad weight for the overall group was $\rho = .68$ ($P < .0001$) demonstrating a strong positive correlation. PPD was also strongly correlated with pad weight ($\rho = .55$, $P < .0001$). As seen previously, SCT and PPD were correlated ($\rho = .47$, $P < .0001$). In a multivariable model predicting pad weight, the effect of SCT was greater than PPD ($\beta = 83$ [54-111], $P < .0001$ vs 45 [2169], $P = .0004$).

Conclusions: SCT findings strongly correlate to 24-hour pad weights in the evaluation of male SUI. The SCT shows promise as a rapid, reliable, noninvasive measure of SUI severity before anti-incontinence surgery.

KEYWORDS

artificial urinary sphincter, incontinence, sling

1 | INTRODUCTION

Stress urinary incontinence (SUI) is a common urologic condition with a significant negative impact on the quality of life. For male patients with SUI, the 24-hour pad weight test has been established as an accurate method for quantification of urinary incontinence[1,2] and shown to correlate well with the outcome of sling procedures.[3,4] However, logistical collection difficulties have limited the widespread adoption of the 24-hour pad weight test among clinicians worldwide.

The standing cough test (SCT) has been proposed as a rapid, office-based surrogate for the evaluation of male SUI.[2,5] The Male Stress Incontinence Grading Scale (MSIGS) is a modified, standardized application of the SCT designed to stratify patients according to leakage severity and guide surgical planning.[6] The MSIGS has been shown to correspond well to pads per day (PPD) and outcomes of male sling procedures.[6,7]

Although SCT findings have been shown to correlate well to patient-reported PPD,[6] the correlation of MSIGS to 24-hour pad weights has not been studied. We sought to evaluate the relationship between in-office SCT findings and the 24-hour pad weight test. We also assessed outcomes following incorporation of SCT grading before anti-incontinence procedures.

2 | MATERIALS AND METHODS

A retrospective review of a single surgeon database of incontinence procedures was performed from the years 2014 to 2018. We included patients who underwent either an AdVance Sling or an artificial urinary sphincter (AUS) for postprostatectomy SUI. Each patient had a complete medical history with prospectively recorded 24-hour pad weight, patient-reported PPD, postvoid residual (PVR), and SCT completed in the clinic.

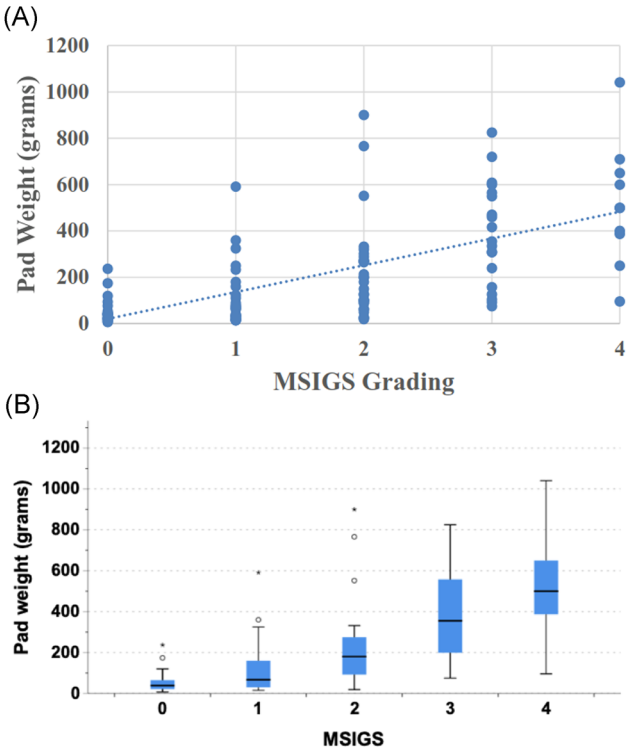
The MSIGS score was used to quantify SCT using a range of 0 to 4 as previously described based on the observed leakage pattern noted during four strong coughs in the standing position.[6,7] When performing the SCT, we ensure that the patient has not voided at least 1 hour before the test to ensure adequate filling of the bladder. In brief, the MSIGS breakdown is as follows: grade 0—leakage reported but not demonstrable on the exam; grade 1—delayed drops only; grade 2—early drops without stream; grade 3—delayed stream; and grade 4—early and persistent stream.

We assessed postoperative pads per day and 30-day complications at follow-up. Success was defined as 0 to 1 PPD. Fisher's exact test was used for comparison of radiation and failure rates. Spearman's correlation was calculated between MSIGS and pad weight primarily, with additional correlations calculated for MSIGS/PPD and MSIGS/body mass index (BMI).

3 | RESULTS

3.1 | SCT correlations

The Spearman's coefficient between MSIGS and pad weight for the overall group was $\rho = .68$ ($P < .0001$), demonstrating a strong positive correlation (Figure 1A).



Grade	Average 24-hour pad weight
MSIGS 0	57.0 g
MSIGS 1	117.3 g
MSIGS 2	223.0 g
MSIGS 3	385.1 g
MSIGS 4	513.3 g

FIGURE 1 A, Strong correlation between MSIGS score and 24-hour pad weight (Spearman's $\rho = .68$, $P < .0001$). B, Twenty-four-hour pad weights associated with MSIGS grading. MSIGS, Male Stress Incontinence Grading Scale

With each overall increase in MSIGS grading, there was a relative increase on average 24-hour pad weight (Figure 1B). PPD was also correlated with 24-hour pad weight, although with a lower coefficient ($\rho = .55$, $P < .0001$). MSIGS and PPD were correlated ($\rho = .47$, $P < .0001$; Figure 2). No significant correlation was identified between MSIGS and BMI (Figure 3).

3.2 | Outcomes

A total of 104 patients underwent an AdVance Sling (n = 65) or AUS (n = 39). The median age of this cohort was 66.5 with an average BMI of 29.6. Overall, 20 patients (19.2%) had a history of radiation, which was more frequent in the AUS group (14/39 [35.9%] vs 6/65 [9.2%]; $P = .002$). The median follow-up was 34.5 weeks. In the overall cohort, 89.4% of patients (93/104) had a successful

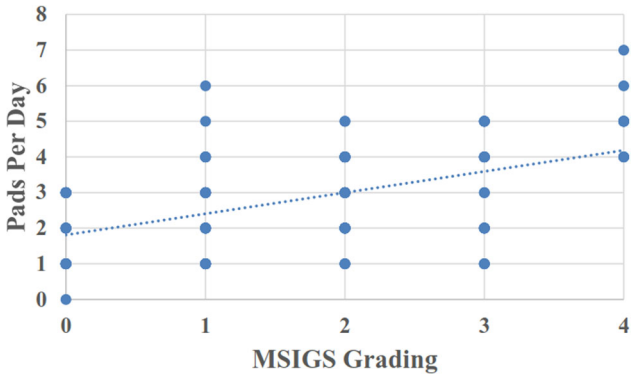


FIGURE 2 Moderate correlation between MSIGS grading and patient-reported pads per day (Spearman's $\rho = .47$, $P < .0001$). MSIGS, Male Stress Incontinence Grading Scale

surgical outcome. When assessing outcomes of sling vs AUS procedures based on SCT quantification, there was no significant difference in failure rates ($P > .5$ for all).

3.3 | Sling patients

Preoperatively, the majority of the 65 sling patients (63/65, 96.9%) had negligible demonstrable SUI (MSIGS = 0-2; Figure 4)—average PPD: 2.4, average pad weight: 128.9 g, median PVR: 0. Six patients had 30-day complications—retention (n = 4), infection of Inflatable Penile Prosthesis (n = 1), wound dehiscence (n = 1). The average PPD dropped from 2.4 preoperatively to 0.5 postoperatively. Seven patients reported greater than one PPD postoperatively for an overall sling success rate of 89.2% (58/65).

3.4 | Patients with AUS

The majority of the 39 patients with AUS had severe urinary leakage observed during SCT (MSIGS score of 3-4) (27/39, 69.2%) (Figure 4). The average PPD preoperatively was 3.6. The average pad weight was 377.6 g. The median PVR for patients with AUS was also 0. One patient was noted to have a 30-day complication—AUS erosion (n = 1). The average PPD dropped from 3.6 preoperatively to 0.6 postoperatively. Four patients reported greater than one PPD postoperatively for an AUS success rate of 89.7% (35/39).

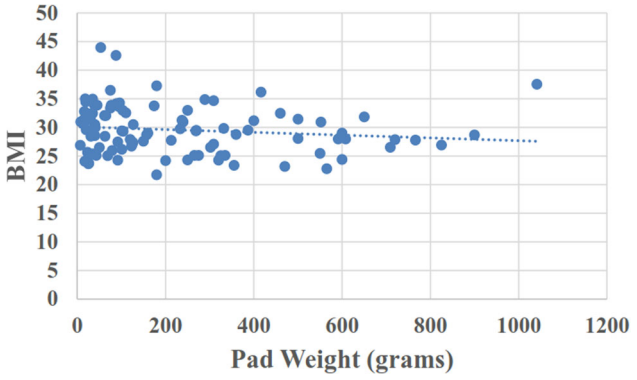


FIGURE 3 No correlation between pad weight (g) and BMI (Spearman's $\rho = -.19$, $P = .06$). BMI, body mass index

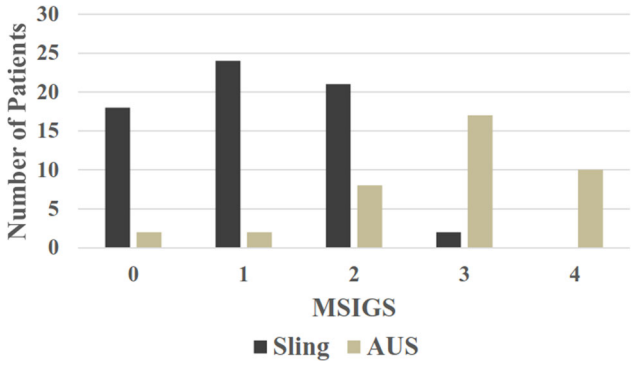


FIGURE 4 Comparison of the distribution of MSIGS grading of sling patients vs patients with AUS. AUS, artificial urinary sphincter; MSIGS, Male Stress Incontinence Grading Scale

4 | DISCUSSION

These data demonstrate a strong correlation between the modified SCT (MSIGS) results and 24-hour pad weights, suggesting that the SCT provides a rapid and reliable estimate of incontinence severity that can be utilized in the clinic setting. This is a critically important finding given that the recent AUA Male SUI Guidelines, AUA/SUFU Guidelines, and International Continence Society expert panel all recommended the objective determination of SUI before the surgical intervention.[2,8,9] Quantification of SCT via MSIGS provides a noninvasive means of assessing incontinence severity. The test has shown value in its ability to stratify patient groups and help with preoperative guidance that is associated with treatment outcomes.[7] In practice, SCT may offer benefits over 24-hour pad weight since it is able to be quickly performed in the office and less cumbersome for both patient and provider.[6]

The emerging role of the SCT for SUI evaluation is highlighted by Henderson et al[5] in a 2018 randomized prospective trial, which demonstrated a high positive predictive value of the SCT for SUI evaluation. Whereas the use of urodynamic testing remains controversial in SUI evaluation, the cough test is considered to be accurate and reproducible in its quantification of urinary incontinence. For patients with mixed incontinence or

detrusor overactivity, a pad-based test may be less reliable for stress incontinence than a cough or Valsalva-based assessment.[5,10] Despite extensive instructions, one study noted 11% of women did not correctly perform the pad test indicating user error playing a role in 24-hour pad test reporting. The pads also proved to be bulky leading to patient noncompliance.[10]

4.1 | 24-Hour PAD weight cutoffs

In regard to sling procedures, 24-hour pad weights have been noted to be predictive of outcomes.[3] Given the reduced efficacy of slings with increasing severity of SUI,[3,4] it is important to have objective data to help in preoperative guidance. While there is no accepted cutoff for SUI procedure selection, slings have significantly lower efficacy above or around 400 g on 24-hour pad test,[3,4,11] with some suggesting a number as low as 200 g.[12] Successful sling outcomes have been noted to be 40% with a 24-hour pad weight greater than 400 g while the average success rate for a 24-hour pad weight of less than 100 g is 86%.[4] We previously proposed that ideal sling candidates have an MSIGS 2 or less.[7] Interestingly, the mean 24-hour pad weight in our series is 223 g for MSIGS 2, near the previously proposed cutoff of 200 g.

4.2 | Postvoid residual

PVR was negligible in this patient cohort (median PVR = 0). This is a valuable contribution and suggests that PVR does not play an important role in the setting of postprostatectomy incontinence. The AUA/SUFU guidelines on incontinence after prostate treatment suggests that a single PVR may or may not be reliable but an elevated PVR may indicate further workup may be needed to rule out bladder dysfunction or anatomic obstruction.[9]

4.3 | Effects of obesity on MSIGS

Although obesity is a known risk factor for SUI, with increased intravesical pressure as a likely cause,[13,14] we found no association between pad weight or MSIGS with BMI, confirming findings of an earlier series.[5] We acknowledge that obesity presents formidable surgical challenges technically during anti-incontinence surgery, but we have found no evidence that obesity independently represents a confounding variable. We believe that the SCT remains a reliable indicator of the degree of male SUI independent of BMI.

4.4 | Limitations

As a single surgeon and retrospective series, our study has inherent limitations. Documentation of PPD was patient-reported, whereas MSIGS and 24-hour pad weight are measured variables. However, this mirrors clinical practice, and groups have shown a correlation of perceived to documented PPD in this population.[15] Our pad-based assessments did not incorporate patient activity level on the day of collection, which other authors have demonstrated may impact 24-hour pad test results.[16] Still, this study represents the first prospective comparison of a standardized office-based assessment of SUI severity to the more time-consuming and challenging gold standard (24-hour PPD).

5 | CONCLUSIONS

Among men with postprostatectomy incontinence, the SCT demonstrated a strong correlation with both 24-hour pad weight and patient-reported PPD. Quantification of the SCT via MSIGS offers a reliable, rapid, and noninvasive assessment of male stress incontinence.

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REFERENCES

1. Rasmussen A, Mouritsen L, Dalgaard A, Frimodt-Møller C. Twenty-four hour pad weighing test: reproducibility and dependency of activity level and fluid intake. *Neurourol Urodyn*. 1994;13:261-265.
2. Averbeck MA, Woodhouse C, Comiter C, et al. Surgical treatment of post-prostatectomy stress urinary incontinence in adult men: report from the 6th International Consultation on Incontinence. *Neurourol Urodyn*. 2019;38:398-406.
3. Collado Serra A, Resel Folkersma L, Domínguez-Escrig JL, Gómez-Ferrer A, Rubio-Briones J, Solsona Narbón E. AdVance/AdVance XP transobturator male slings: preoperative degree of incontinence as predictor of surgical outcome. *Urology*. 2013;81:1034-1039.
4. Fischer MC, Huckabay C, Nitti VW. The male perineal sling: assessment and prediction of outcome. *J Urol*. 2007;177:1414-1418.
5. Henderson JW, Kane SM, Mangel JM, et al. A randomized comparative study evaluating various cough stress tests and 24-hour pad test with urodynamics in the diagnosis of stress urinary incontinence. *J Urol*. 2018;199:1557-1564.
6. Morey AF, Singla N, Carmel M, et al. Standing cough test for evaluation of post-prostatectomy incontinence: a pilot study. *Can J Urol*. 2017;24:8664-8669.
7. Shakir NA, Fuchs JS, McKibben MJ, et al. Refined nomogram incorporating standing cough test improves prediction of male

transobturator sling success. *Neurourol Urodyn*. 2018;37:2632-2637.

8. Kobashi KC, Albo ME, Dmochowski RR, et al. Surgical treatment of female stress urinary incontinence: AUA/SUFU guideline. *J Urol*. 2017;198:875-883.
9. Sandhu JS, Breyer B, Comiter C, et al. Incontinence after prostate treatment: AUA/SUFU guideline. *J Urol*. 2019;202:369-378. https://doi.org/101097ju0000000000000314
10. Price DM, Noblett K. Comparison of the cough stress test and 24-h pad test in the assessment of stress urinary incontinence. *Int Urogynecol J*. 2012;23:429-433.
11. Kumar A, Litt ER, Ballert KN, Nitti VW. Artificial urinary sphincter versus male sling for post-prostatectomy incontinence–what do patients choose? *J Urol*. 2009;181:1231-1235.
12. Cornu JN, Sèbe P, Ciofu C, Peyrat L, Cussenot O, Haab F. Midterm evaluation of the transobturator male sling for post-prostatectomy incontinence: focus on prognostic factors. *BJU Int*. 2011;108:236-240.
13. Swenson CW, Kolenic GE, Trowbridge ER, et al. Obesity and stress urinary incontinence in women: compromised continence mechanism or excess bladder pressure during cough? *Int Urogynecol J*. 2017;28:1377-1385.
14. Lai HH, Helmuth ME, Smith AR, et al. Relationship between central obesity, general obesity, overactive bladder syndrome and urinary incontinence among male and female patients seeking care for their lower urinary tract symptoms. *Urology*. 2019;123:34-43.
15. Nitti VW, Mourtzinos A, Brucker BM. Correlation of patient perception of pad use with objective degree of incontinence measured by pad test in men with post-prostatectomy incontinence: the SUFU pad test study. *J Urol*. 2014;192:836-842.
16. Malik RD, Cohn JA, Fedunok PA, Chung DE, Bales GT. Assessing variability of the 24-hour pad weight test in men with post-prostatectomy incontinence. *Int Braz J Urol*. 2016;42:327-333.

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