Daily Pad Usage Versus the International Consultation on Incontinence Questionnaire Short Form for Continence Assessment Following Radical Prostatectomy

Antonio Tienza1,2, Petra L. Graham3, Jose E. Robles1, Fernando Diez-Caballero1, David Rosell1, Juan I. Pascual1, Manish I. Patel4,5, Sean F. Mungovan6,7,8

1Department of Urology, Clínica Universidad de Navarra, Pamplona, Spain
2Department of Urology, Hospital Universitari Son Espases, Palma de Mallorca, Spain
3Centre for Economic Impacts of Genomic Medicine (GenIMPACT), Macquarie University, Sydney, Australia
4Discipline of Surgery, Sydney Medical School, The University of Sydney, Sydney, Australia
5Department of Urology, Westmead Hospital, Sydney, Australia
6Westmead Private Physiotherapy Services, Westmead Private Hospital Sydney, Sydney, Australia
7The Clinical Research Institute, Sydney, Australia
8Department of Health Professions, Faculty of Health, Arts and Design, Swinburne University of Technology, Melbourne, Australia

**Purpose:** Continence assessment is an essential component of follow-up after radical prostatectomy (RP). Several methods exist to assess the severity of urinary incontinence (UI). Our study examined the relationship and degree of agreement between International Consultation on Incontinence Questionnaire Short Form (ICIQ-SF) scores and the number of pads used in a 24-hour period in the assessment of UI following RP.

**Methods:** Continence was prospectively assessed in 746 men from a Spanish urology clinic 12 months after RP using the ICIQ-SF and pad usage. The relationship between ICIQ-SF scores and pad usage was assessed using Spearman rank correlation coefficients. The Jonckheere-Terpstra trend test was used to determine whether the ICIQ-SF score and the component question scores increased with increasing pad usage. The Bonferroni-corrected pairwise Wilcoxon rank-sum test was used to determine which pairs of pad usage levels differed. The weighted kappa was used to evaluate the agreement between pad usage levels and ICIQ-SF questions.

**Results:** The continence rate was 82% using the “no pad usage” definition of continence versus 78% using the definition of an ICIQ-SF score of 0 (P < 0.001). Strong positive correlations were observed between the number of pads and the ICIQ-SF total and component question scores (r > 0.85, P < 0.001). The ICIQ-SF total and component question scores increased significantly with increasing pad usage (P < 0.001). The ICIQ-SF scores (P < 0.018) for all pairs of pad usage levels (0, 1, 2, or 3 or more) differed significantly. The agreement between the ICIQ-SF leakage amount question and pad usage was very good (r = 0.861, P < 0.001).

**Conclusions:** At 12 months post-RP, 24-hour pad usage was closely correlated with ICIQ-SF, although the continence rate differed depending on the definition used. Higher levels of pad usage were associated with higher questionnaire scores, more leakage, and poor quality of life (interference with everyday life).

**Keywords:** Urinary incontinence; Radical prostatectomy; Questionnaires; Assessment

**Research Ethics:** This study was approved by the ethics committee of Clínica Universidad de Navarra within the Applied Medical Research’s first author dissertation.

**Conflict of Interest:** No potential conflict of interest relevant to this article was reported.
INTRODUCTION

Urinary incontinence (UI) is a likely sequela of radical prostatectomy (RP) [1]. Wide variation exists in the terms used to define continence after RP, which affects the reported prevalence of UI [2]. The International Continence Society defined UI as “the complaint of any involuntary loss of urine” [3]. There is more agreement on using the time point of 12 months to define continence after surgery.

Several assessment methods have been developed to define and to measure the severity of UI, including pad weight testing protocols [1,4–6], patient self-report questionnaires [1,5,7], and documenting the number of pads used in 24 hours (pad usage) [1,5,8,9]: pad weight testing protocols offer an objective and quantitative measure of UI, and are considered the gold standard by some [6]. Questionnaires are a patient-reported tool that have ideally been validated and may show an impact on quality of life (QoL). The Short Form of the International Consultation on Incontinence Questionnaire (ICIQ-SF) is widely used in RP outcome studies. Using this instrument, a total score is derived from 3 questions; the first and second ask patients to subjectively evaluate the frequency and severity of their UI symptoms respectively, and the third evaluates condition-specific QoL, in which the interference of UI with everyday life is evaluated using a scale from 0 (not at all) to 10 (a great deal) [10]. The number of pads used per day is an easy way for patients to report their experiences, and is an accessible method for assessing severity, for which reason it is the most frequently used tool to assess UI after RP [1,11].

The aim of this study was to comprehensively examine the relationship and degree of agreement between daily pad usage and the ICIQ-SF total and question scores.

MATERIALS AND METHODS

Following institutional ethical approval, consecutive consenting patients who underwent RP for clinically localised or locally advanced prostate cancer were recruited between September 2002 and December 2011. Patients who underwent salvage RP after radiation therapy were excluded. Patient characteristics including surgical and pathological factors were recorded. Continence status was assessed at 12 months following surgery using (1) the total score of the Spanish version of the ICIQ-SF [12] and its component questions and (2) the patient-reported number of pads used within a 24-hour period (pad usage). Information was gathered on the type of pad (compress or diaper) and degree of absorption: level 1, 2, or 3 for compress pads and day- and night-time use diapers, respectively. Pad usage was divided into 4 levels: 0, 1, 2, and 3 or more pads, due to the small number of patients who used more than 3 pads per day.

Statistical Analysis

Means and standard deviations or medians and interquartile ranges (IQR) were used to describe continuous variables. Categorical variables were summarised using counts with percentages or proportions. The McNemar test was used to determine differences in continence according to the definition used. Spearman rank correlation coefficients were used to measure the strength of the relationship between pad usage and ICIQ-SF scores. The Jonckheere-Terpstra trend test [13] was used to determine whether the ICIQ-SF question and overall scores increased with increasing levels of pad usage (0, 1, 2, or 3 or more). If the Jonckheere-Terpstra test indicated significance, the Bonferroni-corrected pairwise Wilcoxon rank-sum test was used to determine which pairs of pad usage levels (0, 1, 2, or 3 or more) had significantly different ICIQ-SF scores. These methods were used due to the nonnormality of the scores. Treating the data as categorical, the Fleiss-Cohen weighted kappa statistic [14] was used to determine the agreement between pad usage levels and the related ICIQ-SF question regarding leakage amount (question 2). Kappa values (κ) were interpreted as poor for κ < 0.20, fair for 0.21 < κ < 0.40, moderate for 0.41 < κ < 0.60, good for 0.61 < κ < 0.80, and very good for 0.81 < κ < 1.00, as described by Altman [15]. To compare pads and ICIQ scores by type of pad, we performed the Student t-test. R statistical software ver. 3.5.2 (R Foundation for Statistical Computing, Vienna, Austria) and a 5% significance level were used for all analyses.

RESULTS

In total, 787 consecutive patients underwent RP for clinically localised or locally advanced prostate cancer between September 2002 and December 2011. Forty-one patients were excluded because they had undergone salvage RP or were lost to follow-up. A total of 746 consenting patients were included in the analysis. The demographic, clinical, and surgical characteristics of patients are presented in Table 1.

The continence rate using the “no pad” definition of continence (82.3%) was significantly higher than the rate calculated...
when continence was defined as an ICIQ-SF total score of 0 (78%) (P < 0.001). Table 2 shows information on patients divided first by their questionnaire answers and then by pad usage. Question 4 collected information on the situations in which patients experienced leakage, and it should be noted that some patients reported experiencing leakage in more than one situation. Overall, 14 (8.5%) reported urgency before UI and 109 (66.4%) reported stress-based UI.

The daily number of pads used by the participants was as follows: 1 pad by 74 men (9.9%), 2 pads, 31 (4.2%); and 3 or more pads, 27 (3.6%). The median (IQR) ICIQ-SF total and question scores for each level of pad usage are presented in Table 3.

Strong positive Spearman correlation coefficients were observed between pad usage and the ICIQ-SF total score (0.865, P < 0.001), ICIQ-SF question 1 score (0.871, P < 0.001), ICIQ-SF question 2 score (0.861, P < 0.001), and ICIQ-SF QoL question 3 score (0.853, P < 0.001).

### Table 1. Demographic, clinical, and surgical characteristics of the participants (n = 746)

| Characteristic                  | Mean ± SD (range) | Median (IQR) |
|--------------------------------|-------------------|--------------|
| Age (yr)                       | 63 ± 7 (41–83)    | 63 (58–68)   |
| Body mass index (kg/m²)        | 27.4 ± 3.4 (16.3–48.0) | 27.0 (25.2–29.15) |
| PSA (ng/mL) (n = 541)          | 9.4 ± 8.8 (2.2–136.0) | 7.1 (5.5–10.25) |
| Prostate volume (mL) (n = 546) | 49.3 ± 24.4 (5.3–196.3) | 43.6 (32.8–59.47) |
| Pathological stage, n (%)      | 535 (27.7)        |              |
| ≥T3                            | 207 (71.7)        |              |
| Missing                        | 4 (0.6)           |              |
| Pathological Gleason grade group, n (%) | 424 (57) |              |
| 1                              | 129 (17)          |              |
| 2                              | 48 (6)            |              |
| 3                              | 91 (12)           |              |
| 5                              | 38 (5)            |              |
| Missing                        | 16 (2)            |              |
| Type of surgery, n (%)         | 545 (73)          |              |
| RRP                            | 201 (27)          |              |
| Nerve sparing status, n (%)    | 431 (58)          |              |
| Yes (unilateral or bilateral)  | 315 (42)          |              |
| Protection, no. of patients (%)| 132 (17.7)        |              |
| Mean (pads/day)                | 1.75 ± 1.23       |              |
| Type of protection              |                    |              |
| Compress/pad                    | 101/132 (77.1)    |              |
| Diaper                         | 30/132 (22.9)     |              |
| Type of compress                |                    |              |
| Level 1                        | 50/95 (52.6)      |              |
| Level 2                        | 35/95 (36.8)      |              |
| Level 3                        | 10/95 (10.5)      |              |
| Type of diaper                  |                    |              |
| Absorbent                      | 26/30 (86.7)      |              |
| Extra-absorbent                | 4/30 (13.3)       |              |

SD, standard deviation; IQR, interquartile range; PSA, prostate-specific antigen; RRP, retropubic radical prostatectomy; LRP, laparoscopic radical prostatectomy.

Values are presented as mean ± standard deviation or number (%). ICIQ-SF, International Consultation on Incontinence Questionnaire Short Form. Six of 101 patients were not able to answer the type of compress.
The ICIQ-SF total and component question scores increased significantly with increasing levels of pad usage ($P < 0.001$). The ICIQ-SF total and QoL question 3 scores differed significantly between all pairs of pad usage levels (0, 1, 2, or 3 or more pads) ($P \leq 0.018$ and $P \leq 0.025$, respectively). For the remaining questions, the ICIQ-SF question 1 and 2 scores differed significantly ($P < 0.001$) between all pairs of pad usage levels, except for the use of 2 pads versus 3 or more pads (Q1: $P = 1.000$ and Q2: $P = 0.071$, respectively).

Table 3. Pad usage count (%) and median (IQR) ICIQ-SF scores

| No. of pads | No. (%) | ICIQ-SF total score | ICIQ-SF Q1 score | ICIQ-SF Q2 score | ICIQ-SF QoL (Q3) score |
|-------------|---------|---------------------|-----------------|-----------------|-----------------------|
| 0           | 614 (82.3) | 0 (0)              | 0 (0)           | 0 (0)           | 0 (0)                 |
| 1           | 74 (9.9)    | 9.00 (7.25–11.00)   | 3 (3–4)         | 1 (1–1)         | 4 (3–5)               |
| 2           | 31 (4.2)     | 13.0 (10.5–15.0)    | 4 (4–5)         | 2 (1–2)         | 5.00 (3.75–7.00)      |
| 3 or more   | 27 (3.6)    | 16 (13–18)          | 4 (4–5)         | 2 (2–3)         | 7 (5–8)               |

IQR, interquartile range; ICIQ-SF, International Consultation on Incontinence Questionnaire Short Form; QoL, quality of life.

Table 4. Count of pad usage level versus ICIQ-SF Q2 categories (n = 746)

| How much leaks? | 0 Pad | 1 Pad | 2 Pads | 3 or more pads |
|------------------|-------|-------|--------|----------------|
| None             | 579   | 2     | 1      | 0              |
| A small amount   | 30    | 58    | 9      | 3              |
| A moderate amount| 3     | 12    | 17     | 14             |
| A large amount   | 2     | 2     | 4      | 10             |

ICIQ-SF, International Consultation on Incontinence Questionnaire Short Form; QoL, quality of life.

Table 3 shows a cross-tabulation of pad usage levels and the categories of ICIQ-SF question 2 (small, moderate, or large amounts of leakage).

We hypothesized that if a patient complained of more leakage, the patient would use more pads each day, and then we measured the level of agreement between these parameters. There was very good agreement between levels of pad usage and the ICIQ-SF question 2 categories ($\kappa = 0.83$; 95% confidence interval, 0.78–0.88). Most patients (655 of 746, 87.8%) showed agreement between the leakage amount and pad usage level. A few patients (on the nondiagonal parts of Table 4) wore more or fewer pads than we might expect given their leakage level.

Finally, we compared the number of pads that patients needed according to the type of pad (compress vs. diaper: $1.72 \pm 1.19$ vs. $2.17 \pm 1.23$; $P = 0.78$). We then compared ICIQ-SF scores (compress vs. diaper: $10.74 \pm 3.7$ vs. $13.9 \pm 3.46$; $P = 0.000$); and finally question 3 about QoL (compress vs. diaper: $4.41 \pm 2.24$ vs. $5.4 \pm 2.0$; $P = 0.033$).

**DISCUSSION**

In a large sample of men (n = 746), the reported continence rate using definitions of no pad usage or an ICIQ-SF total score of 0 was similar to those reported in some previous investigations [16,17], but higher than has been reported in others [5,18]. We must emphasize that prevalence can change considerably depending on the definition.

The number of pads used per day (in a 24-hour period) is the most frequent way to report incontinence in studies of RP outcomes, as it is easy for patients to report [19] and reflects materials that they use in their everyday lives. It is also sufficient to assess daily routines [20], and a previous study found that patients accurately described the number, size, and degree of wetness of pads [19]. Studies have reported significantly worse health-related QoL in patients using 1 pad than in those who were pad-free [21,22]. Pad usage is also a component question included in the Expanded Prostate Cancer Index Composite [23,24].

Pad weight protocols result in a measured variable [19], which better shows the severity of incontinence in a way that is especially valuable when offering a surgical device and is useful as an objective measurement of urine loss in clinical trials [20]. However, these protocols require a high level of patient engage-
Despite the large sample, our investigation has some limitations. The patient cohort was drawn from a single centre. To perform a comprehensive assessment of correlations between tools, a pad weight testing protocol should be included to obtain more evidence. Furthermore, we only assessed patients at a single time point in their recovery following RP, and therefore measured the prevalence of UI instead of the time until the recovery of continence. Our results show that both tools were correlated, but the ICIQ-SF was a more sensitive tool; moreover, 35 patients (4.6%) reported leakage but did not wear any pads, which demonstrates the complexity of the disease. Pad usage and questionnaires offer useful information, but neither substitutes for the other.

In conclusion, the number of pads used in 24 hours was significantly correlated with ICIQ-SF scores in men at 12 months following RP. The questionnaire was more sensitive, as different continent rates were found in our series according to the definition used. Increased pad usage was associated with higher questionnaire scores, a higher amount of leakage, and poor QoL (interference with everyday life).

**REFERENCES**

1. Kretschmer A, Hübner W, Sandhu JS, Bauer RM. Evaluation and management of postprostatectomy incontinence: a systematic review of current literature. Eur Urol Focus 2016;2:245-59.
2. Tienza A, Barba J, Algarra R, Velis JM, Pascual JI, Robles JE, et al. Assessment and prevalence of urinary incontinence after radical prostatectomy: analysis of a historical series. Arch Esp Urol 2015;68:692-700.
3. D’Ancona C, Haylen B, Oelke M, Abranches-Monteiro L, Arnold E, Goldman H, et al. The International Continence Society (ICS) report on the terminology for adult male lower urinary tract and pelvic floor symptoms and dysfunction. Neurourol Urodyn 2019;38:433-77.
4. Geraerts I, Van Poppel H, Devoogdt N, Van Cleynenbreugel B, Jo-
niau S, Van Kampen M. Prospective evaluation of urinary incontinence, voiding symptoms and quality of life after open and robot-assisted radical prostatectomy. BJU Int 2013;112:936-43.

5. Machioka K, Kadono Y, Naito R, Nakashima K, Iijima M, Kawaguchi S, et al. Evaluating urinary incontinence before and after radical prostatectomy using the international consultation on incontinence questionnaire-short form. Neurourol Urodyn 2019;38:726-33.

6. Sathianathen NJ, Johnson L, Bolton D, Lawrentschuk NL. An objective measurement of urinary continence recovery with pelvic floor physiotherapy following robotic assisted radical prostatectomy. Transl Androl Urol 2017;6(Suppl 2):S59-63.

7. Grivas N, van der Roest R, Schouten R, Cavicchioli F, Tillier C, Bex A, et al. Quantitative assessment of fascia preservation improves the prediction of membranous urethral length and inner levator distance on continence outcome after robot-assisted radical prostatectomy: Neurourol Urodyn 2018;37:417-25.

8. Matsushita K, Kent MT, Vickers AJ, von Bodman C, Bernstein M, Touijer KA, et al. Preoperative predictive model of recovery of urinary continence after radical prostatectomy: BJU Int 2015;116:577-83.

9. Haga N, Ogawa S, Yabe M, Akaihata H, Hata J, Sato Y, et al. Factors contributing to early recovery of urinary continence analyzed by pre- and postoperative pelvic anatomical features at robot-assisted laparoscopic radical prostatectomy. J Endourol 2015;29:683-90.

10. Avery K, Donovan J, Peters TJ, Shaw C, Gotoh M, Abrams P. ICIQ: a brief and robust measure for evaluating the symptoms and impact of urinary incontinence. Neurourol Urodyn 2004;23:322-30.

11. Novara G, Ficarra V, Délia C, Secco S, Cioffi A, Cavalleri S, et al. Evaluating urinary continence and preoperative predictors of urinary continence after robot assisted laparoscopic radical prostatectomy. J Urol 2010;184:1028-33.

12. Castro-Díaz DM, Esteban-Fuertes M, Salinas-Casado J, Bustamante-Alarma S, Gago-Ramos JL, Galacho-Bech A, et al. Assessment of the psychometric properties of the Spanish language version of questionnaire ICIQ-Male Lower Urinary Tract Symptoms (ICIQ-MLUTS). Actas Urol Esp 2014;38:71-7.

13. Hollander M, Wolfe DA, Chicken E. Nonparametric statistical methods. 3rd ed. Hoboken (NJ): John Wiley & Sons, Inc.; 2014.

14. Fleiss JL, Cohen J, Everitt BS. Large sample standard errors of kappa and weighted kappa. Psychol Bull 1969;72:323-7.

15. Altman DG. Practical statistics for medical research. Boca Raton (FL): Chapman & Hall/CRC; 1999.

16. Hikita K, Honda M, Kawamoto B, Tsounapi P, Muraoka K, Sejima T, et al. Evaluation of incontinence after robot-assisted laparoscopic radical prostatectomy: using the international consultation on incontinence modular questionnaire short form and noting the number of safety pads needed by Japanese patients. Yonago Acta Med 2017;60:52-5.

17. Rajih E, Meskawi M, Alenizi AM, Zorn KC, Alnazeri M, Zanaty M, et al. Perioperative predictors for post-prostatectomy urinary incontinence in prostate cancer patients following robotic-assisted radical prostatectomy: long-term results of a Canadian prospective cohort. Can Urol Assoc J 2019;13:E125-E131.

18. Grabbert M, Buchner A, Butler-Ransohoff C, Kretschmer A, Stief CG, Bauer RM. Long-term functional outcome analysis in a large cohort of patients after radical prostatectomy. Neurourol Urodyn 2018;37:2263-70.

19. Nitti VW, Mourtzinos A, Brucker BM; SUFU Pad Test Study Group. 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;192:836-42.

20. Abrams P, Cardozo L, Full M, Griffiths D, Rosier P, Ulmsten U, et al. The standardisation of terminology in lower urinary tract function: report from the standardisation sub-committee of the International Continence Society. Urology 2003;61:37-49.

21. Cooperberg MR, Master VA, Carroll PR. Health related quality of life significance of single pad urinary incontinence following radical prostatectomy. J Urol 2003;170(2Pt 1):512-5.

22. Liss MA, Osann K, Canvasser N, Chu W, Chang A, Gan J, et al. Continence definition after radical prostatectomy using urinary quality of life: evaluation of patient reported validated questionnaires. J Urol 2010;183:1464-8.

23. Wei JT, Dunn RL, Litwin MS, Sandler HM, Sandra MG. Development and validation of the expanded prostate cancer index composite (EPIC) for comprehensive assessment of health-related quality of life in men with prostate cancer. Urology 2000;56:899-905.

24. Chang P, Szymanski KM, Dunn RL, Chipman JJ, Litwin MS, Nguyen PL, et al. Expanded prostate cancer index composite for clinical practice: development and validation of a practical health related quality of life instrument for use in the routine clinical care of patients with prostate cancer. J Urol 2011;186:865-72.

25. 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;13:261-5.

26. Dylewski DA, Jamison MG, Borawski KM, Sherman ND, Amundsen CL, Webster GD. A statistical comparison of pad numbers versus pad weights in the quantification of urinary incontinence. Neurourol Urodyn 2007;26:3-7.
27. Haga N, Yanagida T, Yabe M, Akaihata H, Hata J, Sato Y, et al. Timing of urinary pad exchanges was the most important factor affecting quality of life in the early postoperative period after robot-assisted laparoscopic radical prostatectomy. J Endourol 2015;29:1044-51.

28. Nyarangi-Dix JN, Tichy D, Hatiboglu G, Pahernik S, Tosev G, Hohenfellner M. Complete bladder neck preservation promotes long-term post-prostatectomy continence without compromising midterm oncological outcome: analysis of a randomised controlled cohort. World J Urol 2018;36:349-55.

29. Mungovan SF, Huijbers BP, Hirschhorn AD, Patel MI. Relationships between perioperative physical activity and urinary incontinence after radical prostatectomy: an observational study. BMC Urol 2013;13:67.

30. Arcila-Ruiz M, Brucker BM. The role of urodynamics in post-prostatectomy incontinence. Curr Urol Rep 2018;19:21.

31. Comiter CV, Dobberfuhl AD. The artificial urinary sphincter and male sling for postprostatectomy incontinence: which patient should get which procedure? Investig Clin Urol 2016;57:3-13.

32. Kretschmer A, Nitti V. Surgical treatment of male postprostatectomy incontinence: current concepts. Eur Urol Focus 2017;3:364-76.

33. Punnen S, Cowan JE, Dunn LB, Shumay DM, Carroll PR, Cooperberg MR. A longitudinal study of anxiety, depression and distress as predictors of sexual and urinary quality of life in men with prostate cancer. BJU Int 2013;112:E67-E75.

34. Sanda MG, Dunn RL, Michalski J, Sandler HM, Northouse L, Hembroff L, et al. Quality of life and satisfaction with outcome among prostate-cancer survivors. N Engl J Med 2008;358:1250-61.