Neurourology and Urodynamics 31:513–516 (2012)

The Relationship Between Continence and Perineal Body Tone Before and After Radical Prostatectomy: A Pilot Study

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Introduction: Recent preliminary studies showed that tonic-trophic characteristics of the pelvic muscles are related to postoperative male urinary incontinence. The aim of the current study was to test whether perineal body tone (PBT), evaluated using the Beco perineometer (Perineocaliper), is related to urinary continence recovery after robot-assisted laparoscopic prostatectomy (RALP). **Materials and Methods:** The study population consisted of 48 patients who underwent RALP between January and July 2009. Surgical interventions were performed by a single surgeon and patients were evaluated by a single physiotherapist. All patients were taught pelvic floor muscle exercises (PFME). PBT was evaluated in each patient preoperatively, as well 30 days and 3 months after surgery. In addition, patients were evaluated with a 24-hr pad-test and the International Consultation on Incontinence-questionnaire (ICI-Q). **Results:** Mean age at surgery was 65.5 years (range 46–63). Twenty-four patients underwent a bilateral nerve-sparing procedure (50%). One-month after surgery, 25 (52.1%) patients were continent while 23 (47.9%) patients were still incontinent. A statistically significant difference in preoperative perineometric measures was observed between continent and incontinent patients (mean 1.36 cm vs. 0.80 cm; $P < 0.001$). This difference was even more pronounced when comparing postoperative perineometric measures (mean 1.24 cm vs. 0.43 cm; $P < 0.001$). Evaluation of patients 3 months after surgery showed an increase in perineometric measures (mean increase 0.76 cm). The increase was significantly higher in patients who became continent after 3 months relative to patients who were still incontinent despite PFME (mean perineometric measures 1.45 cm vs. 1.00 cm; $P = 0.021$). **Conclusions:** Our results demonstrate that urinary continence recovery is related to PBT recovery. Further studies are needed to confirm whether perineometric measures may be used as a predictive tool for the risk-stratification of postoperative UI. *Neurourol. Urodynam. 31:513–516, 2012.* © 2012 Wiley Periodicals, Inc.

Key words: perineal body; perineometer; radical prostatectomy; urinary incontinence

INTRODUCTION

Radical prostatectomy (RP) represents the most commonly used therapeutic strategy in patients with clinically localized prostate cancer and a life expectancy of 10 years or more. Despite improvements in surgical techniques, urinary incontinence (UI) is one of the most commonly reported complications after RP and it may dramatically worsen the quality of life of RP candidates.[1] Although the real incidence of UI remains unknown, a recent review article reported that early (3–6 months after RP) UI affects between 0.8% and 87% of RP patients, and late (1 year after RP) UI affects between 5% and 44.5% of RP patients.[2]

Recently, an increasing interest has been dedicated to factors that might be able to predict continence outcomes in patients subjected to RP. To date, several potential predictors have been investigated, such as age, prostate volume, disease stage, body weight, comorbidities, history of previous lower urinary tract dysfunctions, surgical techniques, and urine loss ratio, but unfortunately they rarely reach a high level of evidence.[3]

The pelvic floor muscles (PFM) are thought to play a crucial role in keeping urinary continence (UI).[4] Bo[5] recently showed a direct relationship between the increase in perineal body tone (PBT) and improvement in stress UI in female patients.

According to recent studies, tonic-trophic characteristics of the pelvic muscles may also be related to post-RP UI.[2,6] Hence, the ability to reliably evaluate PBT may be important for stratifying the risk of UI after RP, as well as for determining the efficacy of PFM training both preoperatively and postoperatively.

While perineometry represents one of the most common measurement techniques currently used by physiotherapists to evaluate PBT in the female population,[7–9] to the best of our knowledge there are no studies evaluating the relationship between PBT and continence status after RP. The aim of the current study was to measure PBT in RP candidates using the Beco perineometer (Perineocaliper) and to test the relationship between continence status and PBT before and after RP.

MATERIALS AND METHODS

A pilot prospective observational study was designed. The population consisted of 48 patients who underwent robot-assisted laparoscopic prostatectomy (RALP) for clinically localized prostate cancer between January and July 2009. A single highly experienced surgeon performed all surgical interventions and a dedicated physiotherapist evaluated all patients. Patients' data were prospectively collected in our institutional

Conflict of interest: none.
Eric Rovner led the peer-review process as the Associate Editor responsible for the paper.
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Received 24 June 2011; Accepted 19 September 2011
Published online 6 March 2012 in Wiley Online Library (wileyonlinelibrary.com).
DOI 10.1002/nau.21230

database. Inclusion criteria consisted of patients aged <65 years old with localized prostate cancer who were suitable for a laparoscopic procedure.

Patients were excluded from the current study if they reported preoperative UI, underwent prior pelvic organ surgeries, had central or peripheral neurologic diseases and defects in walking, metabolic diseases, or impaired mental status. Thirty days before RP, all patients started the PFME course, which consisted of intensive PFM training guided by a single physiotherapist twice per week for 30 min as described in a previous study from our institution.[10] Then, 48 hr after catheter removal, patients attended the PFME course twice per week for 1 month and continued PFME for 3 months. Urinary continence was defined as the report of no leak to the question "How often do you leak urine?" of the ICI questionnaire.

PBT was objectively evaluated using the Beco perineometer, which measures the introflection values of the perineal body relative to the ischiatic spines. The PBT was measured with patients supine, in gynecological position without straining. The perineometer was positioned on the ischiatic spines, with its tip located on the central fibrous nucleus (Fig. 1). The graduated scale on the instrument was used to quantify the introflection or the descent of the perineum in each patient. The relationship between PBT and continence recovery after RP was examined. Specifically, PBT was measured in each patient preoperatively, as well as 30 days and 3 months after RP. Additionally, patients were evaluated with a 24-hr pad-test and the International Consultation on Incontinence-questionnaire (ICI-Q). Statistical analyses consisted of the Mann–Whitney test and the Chi-square test for, respectively, comparison of means and proportions. All statistical analyses were performed using the Statistical Package for Social Sciences version 17 (SPSS, Chicago, IL).

RESULTS

Descriptive characteristics of the study population are reported in Table I. Mean patient age was 65.5 years (range 48–63) and mean body mass index was 25.9 (range 21.6–32.5). Bilateral nerve-sparing RP was performed in 24 (50.0%) patients, while monolateral and non-nerve sparing RP were performed in, respectively, 9 (18.8%) and 15 (31.2%) patients. Pathological Gleason score was 3 + 3, 3 + 4, and 4 + 3 in 40 (80.3%), 6 (12.5%), and 2 (4.2%) patients. Overall, 45 (93.8%) patients had a pT2 PCa, while 3 (6.2%) had a pT3 PCa at final pathology. Mean perineometric measures were 1.19 cm (range 0–2.0) preoperatively and 1.09 cm (range −0.5 to 2.0) 1 month after RP.

Fig. 1. The patient is placed supine with his legs flexed. The perineometer is positioned on the ischiatic spines, with its tip located on the central fibrous nucleus.

Overall, 25 (52.1%) patients were continent 1 month after RP. Conversely, 23 (47.9%) patients were still incontinent 1 month after surgery. In this patient category, mean ICI-Q score was 8.2 (range: 6–14) and mean pad-test 70 gr (30–150). No statistically significant differences were observed between patients who were, respectively, continent incontinent 1 month after RP, except for preoperative and postoperative perineometric measures. Specifically, patients who experienced early (1 month) continence recovery after RP showed a statistically significantly higher preoperative perineometric measure relative to patients who were still incontinent at this time point (1.36 cm vs. 0.80 cm; $P < 0.001$). Similarly, postoperative perineometric measures were higher in continent patients relative to incontinent individuals (1.24 cm vs. 0.43 cm). Interestingly, 3 months after RP, a notable increase in PBT was observed in incontinent patients who were trained with PFME for 3 months after RP (mean perineometric measure after PFME: 1.24 cm; range: 0–2.0).

When focusing on the group of patients who were still incontinent 1 month after RP, 12 patients (52.2%) became continent 3 months after surgery, whereas 11 (47.8%) of patients were still incontinent at 3 months despite PFME (Table II). When comparing these two groups of patients, post-PFME perineometric measure was statistically significantly higher difference in patients who became continent relative to incontinent individuals (1.45 cm vs. 1.00 cm; $P = 0.0021$).

Figure 2 shows the box-and-whiskers plots depicting the distribution of perineometric measures across the study population. Interestingly, none of the patients who were continent 1 month after RP had a preoperative perineometric measure <1 cm. Conversely, all patients incontinent 1 month after RP had a postoperative perineometric measure ≤1 cm.

COMMENT

UI is a potential consequence of RP that may dramatically worsen the quality of life of RP candidates.[1] Many efforts have been made in order to find factors that may help to predict functional outcomes after RP. The results of the present study showed an important relationship between postprostatectomy urinary continence recovery and PBT. In addition, our data demonstrate that perineometric measures represent a simple and reliable method for assessing PBT. As there is no standard definition of postprostatectomy stress UI and no general agreement on the best clinical assessment method, we believe that an objective evaluation of postprostatectomy UI is essential not only to properly evaluate incontinence itself but also to evaluate the ability of new surgical techniques or postoperative treatments to improve or hasten continence recovery.

Perineometry is one of the most common measurement techniques currently used by physiotherapist to evaluate female PFM contraction in clinical and scientific settings.[5,7–9] Henry et al.[11] were the first to demonstrate a relationship between the anal verge and the ischial tuberosities in patients with descending perineum syndrome. More recently, Benson et al.[12] introduced the term "perineometer" to name the instrument used for this purpose and "perineometry" to describe the information derived using such device. Previously, Kegel had also adopted the word perineometer for describing an instrument that was introduced in the vagina to measure the increase of pressure induced by a perineal contraction.[13]

While the perineometer has been widely adopted in females to reliably evaluate PFM contraction, there are no studies

TABLE I. Descriptive Characteristics of the Study Population

	Overall	Continent Pts 1 month after RP	Incontinent Pts 1 month after RP	*P*-value
Number of patients	48	25 (52.1%)	23 (47.9%)	—
Age	65.5 (67; 48–63)	64.9 (66; 48–83)	66.2 (67; 58–72)	0.584
Body mass index	25.9 (25.5; 21.6–32.5)	25.4 (25.3; 21.6–30.6)	26.5 (26.1; 22.8–32.5)	0.364
Gleason score	40 (80.3%)	22 (88.0%)	18 (78.3%)	0.313
3 + 3	6 (12.5%)	3 (12.0%)	3 (13.0%)	
3 + 4	2 (4.2%)	—	2 (8.7%)	
4 + 3				
Pathological T stage				0.062
pT2	45 (93.8%)	25 (100%)	20 (87.0%)	
pT3	3 (6.2%)	—	3 (13.0%)	
Pathological N stage				0.257
pN0	44 (91.7%)	24 (96.0%)	20 (87.0%)	
pNx	3 (6.2%)	1 (4.0%)	3 (13.0%)	
Nerve preservation				0.424
None	15 (31.2%)	8 (32.0%)	7 (30.4%)	
Monolateral	9 (18.8%)	3 (12.0%)	6 (26.1%)	
Bilateral	24 (50.0%)	14 (56.0%)	10 (43.5%)	
Preoperative perineometric measures (cm)	1.19 (1.5; 0–2.0)	1.36 (1.5; 1.0–2.0)	0.80 (1.0; 0–1.5)	<0.001
Postoperative perineometric measures (cm)	1.09 (1.0; −0.5 to 2.0)	1.24 (1.0; 1.0–2.0)	0.43 (0.5; −0.5 to 1.0)	<0.001
Post PFME perineometric measures (cm)	—	—	1.24 (1.5; 0–2.0)	—

reporting the use of this methodology in males. However, in our opinion the same reliability can be achieved when considering male patients. Our study provides the first evidence that, since urinary continence recovery is strictly related to PBT, an objective measure of the preoperative thickness of the PFM is related to the rate of postoperative continence recovery. In addition, our study demonstrates that an increase in post-PFME perineometric measure is also related to better continence outcomes. To the best of our knowledge, this is the first study to directly assess the relationship between post-prostatectomy UI and PBT measured by perineometer.

Several tools for evaluating continence status after RP have been developed. Scientific and regulatory communities confirm the use of questionnaires as tools with good reliability, validity, and consistency.[14,15] However, a criticism of questionnaires may be related to cultural and language adaptation, such as the use of clinical terminology that patients may not comprehend or the real ability to detect whether a change is meaningful to the patient. Therefore, questionnaires are perceived by many to be too complicated to be used in routine clinical practice. Pad-test can either be used as a qualitative diagnostic tool to diagnose UI or as a quantitative test to

TABLE II. Descriptive Characteristics of Incontinent Patients

	Pts continent after PFME (3 months)	Pts incontinent after PFME (3 months)	*P*-value
Number of patients	12 (52.2%)	11 (47.8%)	—
Age	65.4 (66; 58–72–83)	67.1 (68; 62–71)	0.458
Body mass index	26.0 (25.5; 22.8–32.5)	27.1 (26.3; 23.0–31.6)	0.324
Gleason score			0.294
3 + 3	8 (66.7%)	10 (90.9%)	
3 + 4	2 (16.7%)	1 (9.1%)	
4 + 3	2 (16.7%)	—	
Pathological T stage			0.080
pT2	9 (75.0%)	11 (100%)	
pT3	3 (25.0%)	—	
Pathological N stage			0.257
pN0	11 (91.7%)	9 (81.8%)	
pNx	1 (8.3%)	2 (9.2%)	
Type of surgery			0.484
Open	9 (75.0%)	9 (81.8%)	
Laparoscopic	3 (25.0%)	2 (18.2%)	
Nerve preservation			0.384
None	5 (41.7%)	2 (18.2%)	
Monolateral	2 (16.7%)	4 (36.4%)	
Bilateral	5 (41.7%)	5 (45.5%)	
Preoperative perineometric measures (cm)	0.96 (1.0; 0.5–1.5)	0.64 (1.0; 0–1.0)	0.070
Postoperative perineometric measures (cm)	0.54 (0.5; 0–1.0)	0.32 (0.5; −0.5 to 1.0)	0.242
Post-PFME perineometric measures (cm)	1.45 (1.5; 0.5–2.0)	1.00 (1.0; 0–1.5)	0.021

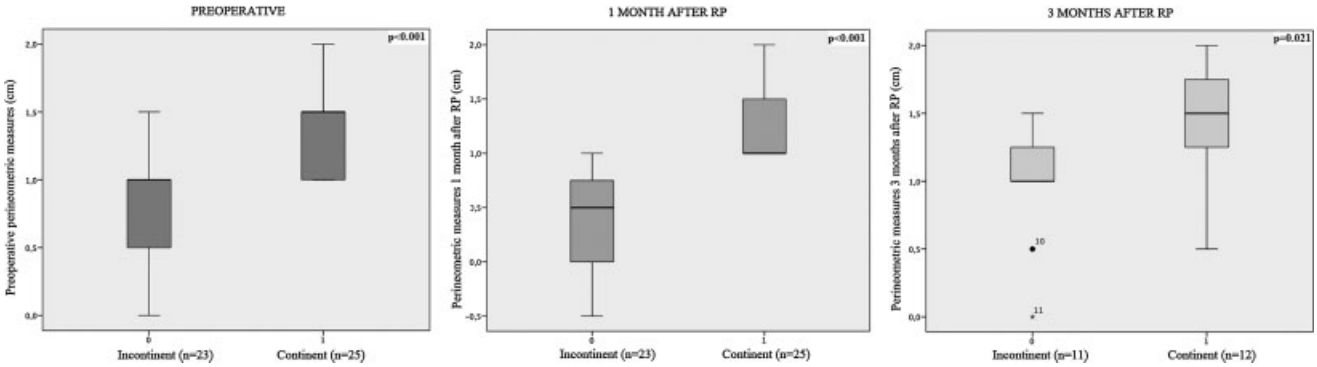

Fig. 2. Box-and-whiskers plots showing the distribution of preoperative and postoperative perineometric measures according to continence status.

grade its severity. However, pad-test does not distinguish between different types of UI. While questionnaires and pad-test still represent pivotal tools for the evaluation continence outcomes, the perineometer represents an objective way of measuring the variations of PBT before and after RP.

The current study has several limitations. First, as this study represents a preliminary report of the feasibility and reliability of perineometer in male patients, our findings are limited by the relatively small sample size. Second, the design of the study allowed us to evaluate early continence recovery at a specific time point after the surgical procedure. Therefore, future studies validating the relationship between perineometric measures and long-term continence outcomes are needed. Third, the use of ICI-Q to define continence may represent an additional limitation as it does not discriminate between stress and urgency incontinence.

In conclusion, we consider important to standardize the assessment and the risk-stratification of postoperative UI: perineometer may be our keystone. Larger prospective controlled studies with long-term follow-up are required to properly address these preliminary findings.

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