Long-Term Continence Outcomes in Men Undergoing Radical Prostatectomy: A Prospective 15-Year Longitudinal Study

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Purpose: We examined the time dependent rates of urinary continence following open retropubic radical prostatectomy.

Materials and Methods: A total of 1,995 men treated with radical prostatectomy were enrolled in a prospective longitudinal outcomes study. The UCLA-PCI-UFS (UCLA-Prostate Cancer Index-Urinary Function Index) was administered at baseline, and 3, 6, 12, 24, 96, 120 and 180 months after open retropubic radical prostatectomy. Urinary continence was defined by 1 pad or less in 24 hours. Two multiple regression models were constructed to evaluate the association of time since open retropubic radical prostatectomy with the UCLA-PCI-UFI score and urinary continence.

Results: The decrease in urinary continence rates between baseline and 15 years (99.6% vs 87.2%, $p < 0.001$), and 2 and 15 years (95.3% vs 87.2%, $p = 0.021$) were statistically significant. Urinary continence rates were consistently higher in the younger group at all time points.

Conclusions: A significant decrease in urinary continence rates was observed between baseline and 2 years, and between 2 and 15 years in the entire cohort. Urinary continence rates in age matched men in the general population who were followed longitudinally for 15 years were comparable to those in our study population. This suggests that while open retropubic radical prostatectomy causes primarily sphincteric urinary incontinence, it may be protective for subsequent benign prostatic hyperplasia mediated urinary incontinence.

Key Words: prostatic neoplasms, prostatectomy, urinary incontinence, treatment outcome, quality of life

Abbreviations and Acronyms

ORRP = open radical retropubic prostatectomy
PSA = prostate specific antigen
RP = radical prostatectomy
RT = radiotherapy
UC = urinary continence
UCLA-PCI = UCLA-Prostate Cancer Index
UFI = Urinary Function Index
UFS = Urinary Function Score
UI = urinary incontinence

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More than half of the men diagnosed with clinically localized prostate cancer undergo RP.[1] Reported rates of UI following RP vary between 8% and 87%.[2] The wide range of UI rates is attributable to the timing and the methodology of assessing UI, the experience of the surgeon and the definition of UI.[3–5]

Regaining UC following RP is time dependent. The majority of men regain UC within 3 months and UC rates progressively increase to 97% by 2 years.[6] Qualitative improvements in UC have been reported in some men up to 7 years following RP.[7]

Cross-sectional and longitudinal prospective population studies demonstrate that UI develops with advancing age in men.[8,9] However, it is poorly understood how this age dependent development of UI affects men who have undergone RP. The objective of the current study was to

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examine the long-term time dependent rates of UI following RP.

MATERIALS AND METHODS

Of the 2,108 who men underwent ORRP from October 2000 through June 2017 as performed by a single surgeon (HL) 1,995 (95%) signed informed consent to participate in an institutional review board approved, prospective longitudinal outcomes study. The UCLA-PCI-UFI was administered at baseline, and 3, 6, 12, 24, 96, 120 and 180 months after ORRP (supplementary Appendix 1, http://jurology.com/). Questionnaires were self-administered during office visits or returned via United States postal mail to a data manager. The operating surgeon was not involved in data collection, entry, retrieval or statistical analysis.

Men were considered continent if they reported using 1 protective pad or less during 24 hours. Total scores on the UCLA-PCI-UFS and continence rates were ascertained at all followups. Pad use was captured by UCLA-PCI-UFI question 3.

Two multiple regression models were used to evaluate the association of time since ORRP with the UCLA-PCI-UFS and with continence status. The first model was a generalized, linear mixed model with individual random effects. The dependent variable was the total UCLA-PCI-UFS specified in continuous terms. The second model was logistic regression in which the dependent variable was continence status, including 1—continent or 0—incontinent, defined as 1 pad or less per day. In each model there was 1 observation per patient per survey period for a total of up to 8 observations, which included baseline plus 7 possible followup times.

Covariates measured at baseline were the preoperative UCLA-PCI-UFS, preoperative PSA, pathological Gleason score, pathological stage, type of nerve sparing surgery, and patient race and marital status. Age was measured at each followup. Missing categories allowed us to include the minority (generally less than 1%) of respondents who only completed a portion of the survey (see table). Robust SEs were used. To account for multiple survey measurements SEs were clustered by individual. A random effect was used for each man to represent other distinguishing characteristics not controlled for by our independent covariates. Supplementary Appendix 2 and the supplementary table (http://jurology.com/) provide examples of regression model results.

In men who completed the baseline and the 3-month UCLA-PCI-UFI the McNemar test and the paired sample t-test were applied to assess whether the proportion of continent men or the mean UCLA-PCI-UFS, respectively, differed significantly between these assessments.

To address potential reporting bias based on continence status we performed paired t-tests comparing the mean preoperative UCLA-PCI-UFS between respondents and nonrespondents at 2, 8, 10 and 15 years. We also compared the mean 2-year UCLA-PCI-UFS between respondents and nonrespondents at 8, 10 and 15 years.

Analyses were performed in STATA/MP™, version 13.1 with differences considered significant at 2-sided $p < 0.05$.

Characteristics of study population of 1,995 men

Mean ± SEM baseline age	59.2 ± 0.16
No. race (%):	
African American	101 (5)
Asian	37 (2)
Caucasian	1782 (89)
Hispanic	41 (2)
Other	33 (2)
Missing	1 (.05)
No. marital status (%):	
Divorced	82 (4)
Married	1701 (85)
Single	185 (9)
Other	27 (2)
Mean ± SEM PSA (ng/ml)	6.37 ± 0.13
No. pathological Gleason score (%) :	
2—6	913 (46)
7	923 (46)
8—10	125 (6)
Missing	34 (2)
No. pathological stage (%):	
0—2	1476 (74)
3—4	485 (24)
Missing	34 (2)
No. nerve sparing (%):	
Bilat	1466 (73)
Unilat	275 (14)
None or blank	254 (13)
Mean ± SE preop UCLA-PCI-UFS	95.4 ± 0.23

RESULTS

Of the 1,995 evaluable men in this study 96%, 95%, 92%, 88%, 82%, 50%, 50% and 38% responded to the baseline, 3 and 6-month, and 1, 2, 8, 10 and 15-year UCLA-PCI-UFS assessments, respectively. There were no significant differences in preoperative UCLA-PCI-UFS, age, preoperative PSA, pathological Gleason score, pathological stage, type of nerve sparing surgery, race or marital status between men who did and did not complete surveys at 15 years. Furthermore, no significant baseline characteristics significantly differed between respondents and nonrespondents at 2, 8, 10 and 15 years (data not shown).

The adjusted mean UCLA-PCI-UFS decreased after RP from 95.5 at baseline to 59.3 at 3 months ($p < 0.001$, fig. 1). The mean UCLA-PCI-UFS increased significantly between each subsequent measurement, peaking at 8 years. There was a slight yet significant decrease in the mean UCLA-PCI-UFS between 8 and 10 years (81.2 vs 79.1, $p = 0.003$). The mean 15-year UCLA-PCI-UFS was significantly decreased compared to baseline (75.0 vs 95.6, $p < 0.001$). The mean UCLA-PCI-UFS was not significantly different between 2 and 15 years (77.5 vs 75.0, $p = 0.18$).

Adjusted time dependent mean UC rates showed a significant decrease between baseline and 3 months after RP (99.6% vs 72.5%, $p < 0.001$, fig. 2). The UC rates subsequently and progressively increased, peaking at 95.4% by 2 years. Beyond 2 years there was a steady decline in UC rates up to 15 years, of

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