

Platinum Priority – Prostate Cancer

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Nerve-sparing Surgery Technique, Not the Preservation of the Neurovascular Bundles, Leads to Improved Long-term Continence Rates After Radical Prostatectomy

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Abstract

Background: The effect of preservation of neurovascular bundles (NVBs) during radical prostatectomy (RP) on continence remains controversial.

Objective: To analyze if the differing surgical techniques of nerve-sparing (NS) versus non-nerve-sparing (NNS) RP and not the preservation of the NVB itself may be responsible for differences in continence rates.

Design, setting, and participants: A total of 18 427 men who underwent RP from 2002 to 2014 in a single high-volume center were analyzed retrospectively. Patients with bilateral NS RP, with primary NNS RP, and with bilateral secondary resection of the NVBs for positive frozen-section results after an initial bilateral nerve sparing (secNNS) RP were studied.

Intervention: NS, NNS, or secNNS RP.

Outcome measurements and statistical analysis: Multivariable and propensity score matched analyses adjusting for age, prostate volume, and year of surgery were performed to assess differences in continence rates after RP. Continence was defined as the use of no or one safety pad per day.

Results and limitations: Post-RP urinary continence rates at 1 wk, 3 mo, and 12 mo were 59.8%, 76.2%, 85.4% in the NS group, 39.5%, 59.5%, and 87.0% in the secNNS group, and 29.1%, 52.8%, and 70.5% in the NNS group. Continence rates at 12 mo after surgery did not differ significantly between patients who had bilateral NS and patients who had resection of both NVBs after an initial nerve-sparing technique (secNNS). In contrast, when comparing the NNS study groups with initial NNS versus secNNS, the latter group had significantly higher continence rates after 12 mo.

Conclusions: Our results indicate that the meticulous apical dissection associated with the NS RP technique rather than the preservation of the NVBs itself may have a positive impact on long-term urinary continence rates.

Patient summary: We looked at continence rates after nerve-sparing (NS) versus non-NS radical prostatectomy (RP). NS surgery technique but not the preservation of the neurovascular bundles led to improved long-term continence rates after RP.

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1. Introduction

Radical prostatectomy (RP) is a common treatment option for prostate cancer but carries a significant risk of urinary incontinence and erectile dysfunction [1]. Although the effect of the preservation of the neurovascular bundles (NVBs) during RP on erectile function is evident, its influence on continence remains controversial. In fact, to date it is unknown if NVBs contribute to the neural supply of the urethral sphincter [2].

Reeves and colleagues recently summarized the existing studies on the influence of the preservation of the NVBs on continence after RP and conducted a meta-analysis using data from 13 749 patients in 27 studies [3]. Their meta-analysis demonstrated improved early urinary continence rates (up to 6 mo postoperatively) for patients undergoing nerve-sparing (NS) RP compared with patients undergoing non-nerve-sparing (NNS) RP. Long-term continence did not differ in the two patient groups. Steineck et al reported a strong association between the degree of NVB preservation and urinary incontinence 1 yr after surgery [4].

Some authors have argued that the difference in continence rates may be attributable to the differing surgical techniques of NS versus NNS RP [3]. The meticulous apical dissection associated with the NS RP technique may be responsible for the improved continence outcome in this patient group [5,6].

To answer this important question, it is necessary to compare continence rates in patients with and without preservation of the NVBs who otherwise underwent the same surgical approach. Since the introduction of a neurovascular structure-adjacent frozen-section examination (NeuroSAFE) in our institution, most RPs were performed using a NS approach with secondary resection of the NVBs in case of positive frozen section [7].

The objective of the present study was to compare continence rates of patients from a large European high-volume center undergoing primary NNS RP, NS RP with preservation of the NVBs, and initially NS RP with secondary resection of the NVBs.

2. Patients and methods

2.1. Patient population

A total of 18 427 consecutive patients who underwent RP from January 2002 to October 2014 in the Martini-Clinic were analyzed retrospectively. Patients with unilateral NS ($n = 4485$), salvage prostatectomy ($n = 70$), or missing follow-up ($n = 1339$) were excluded from the study. Data were collected prospectively into a database approved by the institutional review board. Functional data were assessed using self-administrated questionnaires. RP was performed using an open retropubic approach or robot-assisted laparoscopic approach, as previously described [8,9]. The following three patient groups were studied: patients with bilateral NS RP, patients with primary bilateral NNS RP, and patients with bilateral secondary resection of the NVBs for positive frozen-section results after an initial bilateral NS (secNNS) RP. Continence was defined as the use of zero or one safety pad per day.

2.2. Statistics

Baseline characteristics between the three patient groups were compared using the likelihood ratio chi-square test. We first compared the functional outcome in the three investigated patient groups by comparing the use of pads per day at 1 wk, 3 mo, and 1 yr after RP using the chi-square test. In logistic regression analysis including age at surgery, prostate volume, and year of surgery as confounders we compared the continence status defined as zero or one safety pad in a multivariable setting. We validated our results using propensity score matching analysis. Propensity score matched analysis was performed in a regression model using age, prostate volume, and year of surgery as covariates. Based on estimated propensity scores, one patient from the NS or NNS group was matched (best match) to one patient of the secNNS group by caliper matching [10,11] and using *nonrandom* R package (R Project for Statistical Computing; www.R-project.org) [12]. The selection process was conducted without replacement so that each patient was selected only once. After matching, differences in continence rates 1 wk, 3 mo, and 12 mo after RP between the study groups were assessed. All tests were two tailed, and p values < 0.05 were considered statistically significant. Statistical analyses were performed with JMP software, v.9.0.2 (SAS, USA) and RStudio, v.0.98.945 (<http://http://www.rstudio.com>), an integrated environment development for R (v.3.1.0, <http://www.R-project.org>).

3. Results

3.1. Clinical and pathologic characteristics

Table 1 compares the clinical and pathologic features of the patients. Median age in the entire group was 64 yr (interquartile range: 59–68). Bilateral NS RP was performed in 11 204 patients (89.4%), NNS RP in 1128 patients (9.0%), and secNNS in 201 patients (1.6%).

3.2. Continence rates

In the unadjusted analysis, urinary continence rates (defined as zero or one safety pad) at 1 wk, 3 mo, and 12 mo after surgery were 59.8%, 76.2%, and 85.4%, respectively, in the NS group; 39.5%, 59.5%, and 87.0%, respectively, in the secNNS group; and 29.1%, 52.8%, and 70.5%, respectively, in the NNS group (Table 2).

When comparing the NS and the secNNS groups, who were subject to the same surgical technique, 1 wk and 3 mo continence rates were higher in the NS group (59.8% vs 39.5%; $p < 0.0001$ and 76.2% vs 59.5%; $p = 0.018$). Urinary continence rates in both groups at 12 mo after surgery were comparable (85.4% vs 87.0%; $p = 0.5$). In contrast, when comparing the NNS study groups with initial NNS (NNS) versus secondary NNS (secNNS), the secNNS group had significantly higher continence rates after 12 mo (87.0% vs 70.5%; $p = 0.001$). The 1 wk (39.5% and 29.1%; $p = 0.004$) continence rate was also superior in the secNNS patients compared with the NNS group; the 3 mo (59.5% and 52.8%; $p = 0.23$) continence rate only tended to be better without reaching statistical significance.

Multivariable logistic regression analysis showed a higher probability of being continent in the NS group compared with the secNNS group at 1 wk and 3 mo (Table 3). No statistical difference between both groups was found at 1 yr after surgery. NNS and secNNS showed

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