

Is “extreme” bladder neck preservation in robot-assisted radical prostatectomy a safe procedure?

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Abstract

Introduction: The aim was to investigate the surgical and pathological outcomes of an “extreme” bladder neck preservation in prostate cancer patients treated with robotic radical prostatectomy. The greatest concern about the “extreme” bladder neck preservation is the potential risk of creating a positive surgical margin at the level of bladder neck.

Materials and methods: We prospectively collected data from 88 patients with diagnosed prostate cancer who underwent robotic radical prostatectomy with “‘extreme’ bladder neck preservation.” All surgical procedures were performed by the same expert surgeon (F.D.M.). In this study, “‘extreme’ bladder neck preservation” was considered when the length of the spared intraprostatic segment of bladder neck was ≥ 1 cm. We compared the histopathologic data with those of a homogeneous similar cohort of 88 consecutive patients who underwent robotic radical prostatectomy without bladder neck preservation.

Results: The two groups analyzed were comparable according to clinical and pathological characteristics. A positive surgical margin at the level of bladder neck was found in five (5.7%) cases in the “extreme” bladder neck preservation group and in six cases (6.8%) in the no-bladder neck preservation group. The prostatic base was involved by neoplasia in 14 and 19 patients (15.9% and 21.6%, respectively); of these, five (35.7%) and six (31.6%) had positive surgical margin at the level of bladder neck, respectively. The pathological staging in positive surgical margin at the level of bladder neck patients was pT3 in five (100%) cases in the “extreme” bladder neck preservation group and in four (66.7%) cases when we decided not to preserve the bladder neck.

Conclusion: We demonstrated that “extreme” bladder neck preservation is a safe oncological procedure with similar pathologic findings of a comparable no-bladder neck preservation series. Positive surgical margins at the level of bladder neck are linked to neoplasia with adverse pathological features, rather than the “extreme” bladder neck preservation procedure.

Keywords

Robotic radical prostatectomy, bladder neck, prostate cancer, robotic surgery

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Introduction

Robotic radical prostatectomy (RARP) provides oncologic and functional outcomes which are at least comparable to those obtained with retropubic radical prostatectomy. However, as widely noted, the enhanced ability to view magnified images with the robotic approach includes clarifying the mutual relationships between each structure in the operative field, with consequent knowledge of a “new anatomy.”¹ One of the most impressive examples of the

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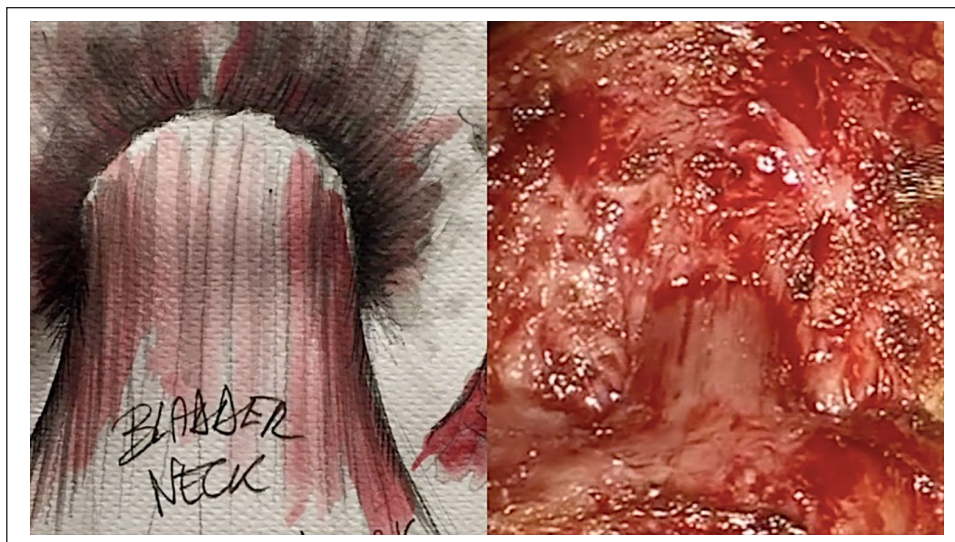


Figure 1. Intraprostatic bladder neck: scheme (left) and intraoperative image (right).

possibilities available today with this “super-vision” is the identification of the bladder neck (BN) during RARP: we can now clearly identify the three separate muscle layers (inner longitudinal, middle circular, and outer longitudinal) which until now were only visible by microscope on cadaver dissections.

Although “old” meta-analyses showed the non-significant impact of bladder neck preservation (BNP) on post-prostatectomy incontinence, more recent studies (mainly robotic) indicate that BNP during radical prostatectomy can enhance early recovery and improve long-term urinary continence by decreasing BN stricture rates.^{2–4}

However, as widely demonstrated, the time of recovery of urinary continence after RP is influenced by several factors, such as age, extent of preservation/non-preservation of the neurovascular bundles, kind of reconstructive technique, and patient’s metabolic status.⁵ For all these reasons, it is extremely difficult to identify the specific “weight” of each factor contributing to the recovery of urinary continence, also due to the mutual influence among the various components.⁶

The greatest concern about the BNP procedure at the present time is the potential risk of creating a positive surgical margin (PSM) at the level of bladder neck (BN-PSM). However, the exact definition of BNP is somewhat confused in literature, and it is often considered to be achieved when a BN reconfiguration is not necessary before urethra-vesical anastomosis. As reported in the relative literature, different degrees of BNP may consequently arise.⁷

To stress the safety of BNP, the aim of this study was to investigate the surgical and pathological outcomes of an “extreme” bladder neck preservation (eBNP) in prostate cancer patients treated with RARP, without making any functional evaluation.

Materials and methods

Between January 2015 and November 2018, we prospectively collected demographic and clinical data (including prostate-specific antigen (PSA); clinical staging according to tumor, node, and metastasis staging; bioptic Gleason score; and D’Amico risk classification) from patients with diagnosed prostate cancer who underwent daVinci® RARP in our Department. Only a few patients performed a multiparametric magnetic resonance imaging (MRI) before the intervention.

In this study, “eBNP” was considered when the length of the spared intraprostatic segment of BN was ≥ 1 cm (measured by using the length of the branches of the curved robotic scissors as a marker) and the neck diameter was comparable to the diameter of the urethra, that is, not requiring BN reconstruction before anastomosis⁸ (Figure 1, Supplemental Video 1).

Starting from this definition, we identified 88 patients with prostate cancer who underwent RARP with eBNP. All surgical procedures were performed by the same expert surgeon (F.D.M.—more than 300 RARP performed).

At the end of surgery, the prostate specimen was fixed in formalin in the standard manner; the paraffin-embedded specimen was histologically examined in the form of 4-mm, whole-mount, hematoxylin- and eosin-stained sections. In other words, the specimen was examined in its entirety in every case. One expert uro-pathologist (M.P.G.) performed all macro/micro-analyses.

We then evaluated the following pathological parameters for each patient: site and side of tumor, final Gleason score, pathological extension of primary tumor, and lymph node involvement. A PSM was defined as the presence of tumor at the inked margin. We considered “BN-PSM” as

the presence of PSM “close to” (<1 mm) the BN area. Any alterations or continuous solutions of the external capsule of the specimen attributable to the surgical technique of eBNP (e.g. capsular incision) were evaluated by microscopic and macroscopic pathological analysis.⁹

To evaluate the safety of the eBNP, we compared the histopathologic data with those of a homogeneous similar cohort of 88 consecutive patients who underwent RARP without BNP.

The major endpoint of this study was the BN-PSM. Descriptive data are presented as means \pm standard deviation (SD) or median (interquartile range (IQR)) according to distribution. We compared clinical and pathological features of two groups to evaluate the homogeneity of data.

Ethical approval

All procedures performed in the present study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its last amendments or comparable ethical standards.

All patients provided their written informed consent for the procedures described here.

Results

Table 1 lists patients' demographic, clinical, and pathologic data of both groups analyzed. The two groups analyzed were comparable according to clinical and pathological characteristics.

A BN-PSM was found in five (5.7%) cases in the eBNP group and in six cases (6.8%) in the no-BNP group. The prostatic base was involved by neoplasia in 14 and 19 patients (15.9% and 21.6%, respectively); of these, five (35.7%) and six (31.6%) had BN-PSM, respectively.

The pathological staging in BN-PSM patients was pT3 in five (100%) cases in the eBNP group and in four (66.7%) cases when we decided not to preserve the BN.

A multiple PSM was found in BN-PSM patients in all the cases (5/5) of the e-BNP group, but in 83.3% of no-BNP patients. No patient showed alterations or continuous solutions of the external capsule of the specimen, attributable to the eBNP surgical technique.

The median time to cystography was 6 days (IQR 4.5–14) in both groups. There was only one case of anastomotic urinary leakage at cystography in the eBNP group.

Comment

Recovery of continence after RP is multifactorial, and its achievement is the result of several surgical approaches and not only of a single surgical procedure. For this reason, continence outcome was not investigated here, and we

focused only on the surgical and pathological outcomes of BNP during RARP.

The potential risk of BN-PSM may, in fact, prevent the use of BNP. This topic is controversial: some authors state that BNP may raise the BN-PSM;¹⁰ others maintain that BNP will not compromise oncological control of the disease and that minimally invasive approaches, particularly RARP, together with the best imaging diagnostic tools, will facilitate safer procedures.¹¹

To address this controversy, in our study, we tried to find any alterations or continuous solutions in the external capsule of the specimen, attributable to the eBNP surgical technique, by microscopic and macroscopic pathological analysis. In our series, no specimen showed any such alterations.

In our study, we demonstrated no significant difference in the percentage of BN-PSM in eBNP and no-BNP groups.

In particular, when we performed an eBNP, a basal tumor was found close (<1 mm) to the BN area in 35.7% of cases. Focusing on the pathological features of these cases, extraprostatic extension of disease (pT3), high Gleason scores,^{9,10} and lymph node involvement in most of them were demonstrated. In addition, multiple PSMs, not only close to the BN, were identified.

Considering that similar results were found in the control group, we could conclude that all patients with BN-PSM after RARP revealed unfavorable pathological features, confirming the laparoscopic experience reported in the literature.¹²

Our study showed that eBNP during RARP is a feasible technique, confirming Brunocilla's experience.⁷ In addition, it causes no alteration or continuous solution of the external capsule of the specimen, attributable to the eBNP surgical technique.

In fact, the eBNP procedure appears to be easy to perform because the separation of the intraprostatic portion of the vesical sphincter from the surrounding prostatic tissue is facilitated by its anatomic features: as documented in specimen slides of prostate at the level of intraprostatic BN (with Van Gieson staining useful to identify collagen and fibroelastic fibers), connective tissue is very limited in the prostatic stroma, while abundant and arranged in bands in the intraprostatic vesical sphincter (Figure 2). This could explain the relative ease and safety in the separation of the BN.

Nevertheless, the question might be the following: Why preserve the BN, even though eBNP is a safe procedure, if its functional impact is controversial? In our opinion, one of the reasons to spare the fibers of the BN is the possibility of preserving a urethral-like neck with a diameter (and a structure) so similar to the distal stump that we can easily achieve an accurate “urethro-urethral” anastomosis, with perfect adhesion of the margins. It is difficult to believe

Table 1. Patients' data.

Demographic and clinical data			
Parameter	eBNP	no-BNP	p value
Age (years), mean (SD)	64.8 (±6.75)	64.4 (±6.6)	0.846852
PSA (ng/mL), median (IQR)	6.1 (4.9–8)	6.4 (4.8–9.7)	0.497443
Bioptic Gleason score (%)			
≤7	78 (88.7%)	71 (80.7%)	0.128716
8	9 (10.2%)	11 (12.5%)	
9	1 (1.1%)	6 (6.8%)	
cT (%)			
cT1c	51 (58%)	49 (55.7%)	0.943716
cT2a	26 (29.5%)	26 (29.5%)	
cT2b	8 (9.1%)	9 (10.2%)	
cT2c	2 (2.3%)	4 (4.6%)	
cT3a	1 (1.1%)	0	
D'Amico risk classification (%)			
Low risk	40 (45.4%)	26 (29.6%)	0.078437
Intermediate risk	35 (39.8%)	42 (47.7%)	
High risk	13 (14.8%)	20 (22.7%)	
Pathological data			
Parameter	Value		
Prostatic weight (g), median (IQR)	51 (36–67)	50.5 (43–70)	0.173207
pT (%)			
pT2	48 (54.5%)	49 (55.7%)	0.879542
pT3	40 (45.5%)	39 (44.3%)	
pN			
pNx/N0	83 (94.3%)	83 (94.3%)	1
pN1	5 (5.7%)	5 (5.7%)	
Final Gleason score (%)			
6	10 (10.4%)	10 (10.4%)	0.852817
7 (3 + 4)	30 (34.1%)	27 (30.6%)	
7 (4 + 3)	20 (22.7%)	18 (20.5%)	
8	19 (21.6%)	19 (21.6%)	
9	9 (10.2%)	14 (15.9%)	
Tumor site (%)			
Base	14 (15.9%)	19 (21.6%)	0.4402
Other sites (but “base-free”)	74 (84.1%)	69 (78.4%)	
BN-PSM (% of all pts: 88/88 cases)			
Present	5 (5.7%)	6 (6.8%)	1
Absent	83 (94.3%)	82 (93.2%)	
BN-PSM (% of pts with basal cancer: 19/14 cases)			
Present	5 (35.7%)	6 (31.6%)	0.721
Absent	9 (64.3%)	15 (68.4%)	
pT in patients with BN-PSM (%)			
pT2	0 (0%)	2 (33.3%)	0.4545
pT3	5 (100%)	4 (66.7%)	
pN in patients with BN-PSM (%)			
pN0	2 (40%)	5 (83.3%)	0.2424
pN1	3 (60%)	1 (16.7%)	
Multiple PSM in patients with BN-PSM (%)			
Present	5 (100%)	5 (83.3%)	1
Absent	0	1 (16.7%)	
Continuous solutions of specimen external capsule due to surgery (%)			
Present	0	0	1
Absent	88 (100%)	88 (100%)	

PSA: prostate-specific antigen; eBNP: "extreme" bladder neck preservation; IQR: interquartile range; BN-PSM: positive surgical margin at the level of bladder neck; SD: standard deviation.

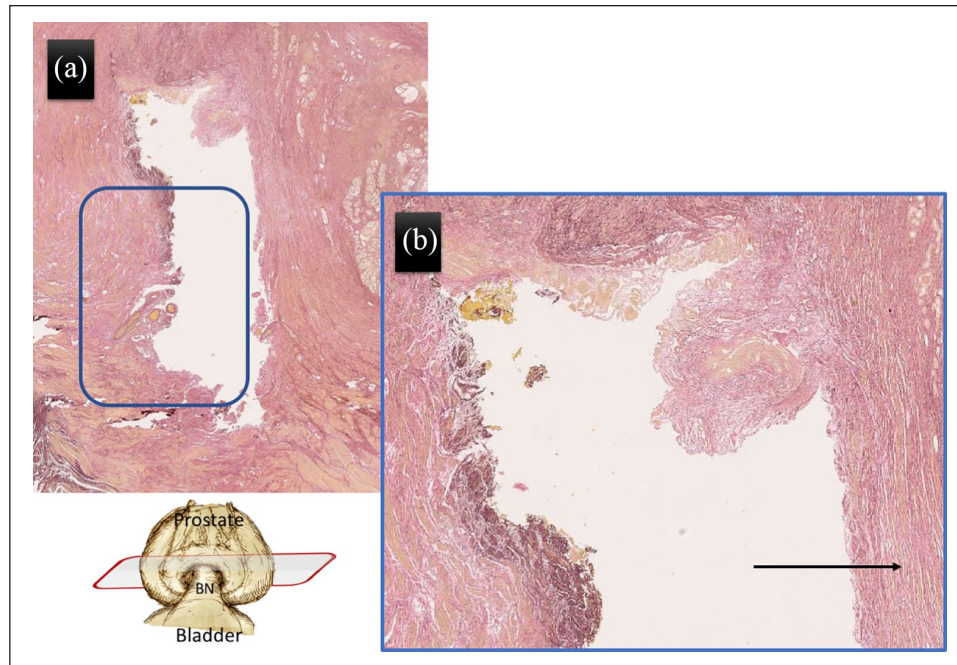


Figure 2. Intraprostatic bladder neck (case of the no-BNP group): (a) slide and (b) particular showing the connective tissue arranged in large bands (arrow).

that a similar match could have no impact on the recovery of continence.

There are several limitations to this study: although patients' data were collected prospectively, we decided to use a retrospective series as control group, even if using the same surgeon. In addition, eBNP patients were not randomized and the number of samples is small. In addition, the BN approach was intraoperatively decided. Thus, patients may have been selected according to individual features and technical considerations encountered intraoperatively. Cases of large prostate, prominent median lobe, or more difficult dissection would probably be spared the eBNP approach.

Conclusion

In this study, we demonstrated that eBNP during RARP is a safe oncological procedure with similar pathologic findings of a comparable no-BNP series. BN-PSMs are linked to neoplasia with adverse pathological features, rather than the eBNP procedure.


Declaration of conflicting interests

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Supplemental material

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