

The bladder neck preservation in robot assisted radical prostatectomy: Surgical and pathological outcome

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Summary

Introduction: The post-prostatectomy incontinence is influenced by multiple elements, anatomic components and biological factors. The bladder neck preservation, more accurate during robot assisted radical prostatectomy, works on two anatomic components responsible for post-prostatectomy continence. The bladder neck preservation spares the internal sphincter, which is responsible for passive continence, and results in earlier return to continence and lower rates of post-prostatectomy incontinence. Moreover, this surgical technique spares the zone of urothelium coaptation and provides primary resistance to the urine to maintain post-prostatectomy continence. The potential risk of bladder neck positive surgical margins (PSM) may prevent the usage of the bladder neck preservation.

Aim: The purpose of this study is to evaluate the surgical and pathological outcome in prostate cancer patients underwent robot assisted radical prostatectomy with bladder neck preservation.

Materials and methods: Prospectively, we have collected demographic, clinical, surgical and pathological data of prostate cancer patients underwent robot assisted radical prostatectomy with bladder neck preservation, from January 2014 to December 2016, in Urological Clinic of the University of Padua. Moreover, it was valued the presence of alterations or continuous solutions of specimen external capsule, attributable to the surgical technique of bladder neck preservation, by microscopic and macroscopic pathological analysis.

Results: According to D'Amico risk classification, 40 patients (45.4%) had a low risk neoplasia, 35 patients (39.8%) had an intermediate risk neoplasia, 13 patients (14.8%) had an high risk neoplasia. The median prostatic volume, valued on specimen, was 30.84 cc (21.5-44.75 cc). The median prostatic weight, valued on specimen, was 51 gr (36-67 gr). The pathological stage of disease was pT2a in 11 cases (12.5%), pT2b in 37 cases (42.1%), pT3a in 28 cases (31.8%), pT3b in 12 cases (13.6%). The pathological stage of lymph node involvement was pNx in 17 cases (19.3%), pN0 in 66 cases (75%), pN1 in 5 cases (5.7%). The prostate cancers diagnosed had a Gleason score at specimen of 6 in 10 cases (10.4%), 7 (3+4) in 30 cases (34.1%), 7 (4+3) in 20 cases (22.7%), 8 in 19 cases (21.6%) and 9 in 9 cases (10.2%). The prostatic base was involved by neoplasia in 14 patients (15.9%); of these, 5 patients (35.7%) had bladder neck PSM. The patients with bladder neck PSM had: a pathological stage of disease as pT3a in 2 cases (40%) and pT3b in 3 cases (60%); a pathological stage of lymph node involvement as pN0 in 2 cases (40%) and pN1 in 3 cases (60%); a Gleason score at specimen of 8 in 3 cases (60%) and 9 in 2 cases (40%);

multiple PSM. Nobody had alterations or continuous solutions of specimen external capsule, attributable to surgical technique of bladder neck preservation.

Conclusions: The bladder neck preservation, during robot assisted radical prostatectomy, is a safe oncological procedure resulting in a good functional outcome, about post-prostatectomy continence, working on two anatomic components responsible for post-prostatectomy continence. The bladder neck PSM are linked to neoplasia with adverse pathological features, rather than the bladder neck preservation.

KEY WORDS: RARP; Bladder Neck Sparing Surgery; Prostate cancer.

Submitted 27 November 2023; Accepted 30 November 2023

INTRODUCTION

Persistent urinary incontinence (UI) after radical prostatectomy (RP), commonly referred to as post-prostatectomy incontinence (PPI), is an adverse event that leads to significant distress. Ficarra *et al.* (1) found that for a "no pad" definition of UI, rates ranged from 4% to 31%, with a mean of 16%.

The PPI is influenced by multiple elements, anatomic components and biological factors (2). The anatomic components that influence on urinary continence, after RP, are the urethral sphincter complex, the supporting structures of the membranous urethra (3), the fibrosis after surgery (4), the neural components (5-8), the zone of urothelium coaptation. The biological factors contributing to PPI are the age (9), the functional bladder changes (10), the body mass index (11), pre-existing low urinary tract symptoms (12), TURP before RP (13), the prostate size (14) and the membranous urethral length (15).

The urethral sphincter complex consists of two functionally independent components, an internal or lissosphincter of smooth muscle and an outer or external rhabdosphincter of skeletal muscle, that are thought to be responsible for passive and active continence, respectively (16). The internal sphincter maintains continence during normal activity when there is little stress on the bladder outlet. Its smooth muscle maintains tone for long periods with minimal exertion. The external urethral sphincter is a muscle that is very strong but becomes fatigued very quickly.

The urothelium is surrounded by elastic tissue and fibers

of smooth and striated muscle. At the junction of the inferior bladder and the proximal urethra, the urothelium becomes a key component of sphincter function. The elastic components of the proximal urethral wall are responsible for coaptation of the urothelium (zone of coaptation). This proper adhesion of the urethral wall provides primary resistance to the urine to maintain continence (17). Little is known about the optimal length of the zone of coaptation. It is hypothesized that it should be at least 5-10 mm to ensure continence (18).

The *bladder neck preservation* (BNP), more accurate during robot assisted *radical prostatectomy* (RARP), works on these two anatomic components responsible for post-prostatectomy continence influencing PPI. The potential risk of bladder neck PSM may prevent the usage of the BNP.

The current study investigates the surgical and pathological outcome of BNP in prostate cancer patients treated with RARP.

MATERIALS AND METHODS

Between January 2014 and December 2016, 88 patients with prostate cancer underwent daVinci® RARP with BNP at the *Urology Department of the University of Padua*.

We prospectively collected demographic data including age, body mass index, comorbidities, previous surgery, erectile function as per the *International Index of Erectile Function 5* (IIEF-5) questionnaire (19), and lower urinary tract symptoms as per the *International Prostate Symptom Score* (IPSS) questionnaire (20), as well as clinical data including prostate-specific antigen status, clinic stage according to tumor, node, and metastasis staging (21), bioptic Gleason Score (22) and D'Amico risk classification (23) for each patient. Surgical data including total operative duration, blood loss, whether a transfusion was performed, time to drain removal, time to cystography and time to catheter removal were also recorded.

The BNP was considered reached when the diameter of the BN was adequate to the diameter of the urethra, not requiring BN neck reconstruction before anastomosis. All surgical procedures were performed by the same expert surgeon.

The prostate specimen was formalin fixed in the standard manner; the paraffin-embedded specimen was examined histologically in the form of 4-mm, whole mount, haematoxylin and eosin stained sections. Therefore, the specimen was examined in its entirety in every case. A positive surgical margin was defined as the presence of tumour at the inked margin (24). Therefore, for each patient we evaluated the following pathological parameters: site and side of the tumour, definitive Gleason Score, pathological extension of the primary tumour and the lymph node involvement. Moreover, it was valued the presence of alterations or continuous solutions of specimen external capsule, attributable to the surgical technique of bladder neck preservation, by microscopic and macroscopic pathological analysis. A single expert uro-pathologist reviewed all RP specimens.

This study did not receive any funding. All patients provided written informed consent for the procedures described herein. Descriptive data are presented as the mean \pm standard deviation or median (interquartile range).

RESULTS

Table 1 summarizes patient demographic and clinical data. The mean patient age was 64.77 ± 6.75 years and the mean body-mass index was 26.73 ± 3.04 kg/m². The median IPSS score was 9 (4,5-14) and the median IIEF-5 score was 17 (11-23). The median prostate-specific antigen value was 6.09 ng/ml (4.92-8.01 ng/ml). The median prostatic volume was 40 cc (38.75-50 cc). Clinical staging was cT1c in 51 patients (58%), cT2a in 26 patients (29.5%), cT2b in 8 patients (9.1%), cT2c in 2 patients (2.3%) and cT3a in 1 patient (1.1%). The bioptic Gleason score was 6 in 48 patients (54.6%), 7 [3 + 4] in 27 patients (30.7%), 7 [4 + 3] in 3 patients (3.4%), 8 in 9 patients (10.2%), 9 in 1 patient (1.1%). As per the D'Amico risk classification, 40 patients (45.4%) had low-risk prostate cancer, 35 patients (39.8%) had intermediate-risk prostate cancer, and 13 patients (14.8%) had high-risk prostate cancer.

Table 2 summarizes pathological data. The median prostatic volume, valued on specimen, was 30.84 cc (21.5-44.75 cc). The median prostatic weight, valued on specimen, was 51 gr (36-67 gr). Pathological stage was pT2a in 11 cases (12.5%), pT2b in 37 cases (42.1%), pT3a in 28 cases (31.8%), pT3b in 12 cases (13,6%). The pathological stage of lymph node involvement was pNx in 17 cases (19.3%), pN0 in 66 cases (75%), pN1 in 5 cases (5.7%). The prostate cancers diagnosed had a Gleason score at specimen of 6 in 10 cases (10.4%), 7 (3+4) in 30 cases (34.1%), 7 (4+3) in 20 cases (22.7%), 8 in 19 cases (21.6%) and 9 in 9 cases (10.2%). The prostatic base was involved by neoplasia in 14 patients (15.9%); of these, 5 patients (35.7%) had bladder neck PSM. The patients with bladder neck PSM had: a pathological stage of disease as pT3a in 2 cases (40%) and pT3b in 3 cases (60%); a pathological

Table 1.
Patient demographic and clinical data.

Parameter	Value
Age (years)	(64.77 \pm 6.75)
BMI (kg/m ²)	(26.73 \pm 3.04)
IPSS score	(9; 4.5-14)
IIEF-5 score	(17; 11-23)
Prostatic volume (cc)	(40; 38.75-50)
PSA (ng/ml)	(6.09; 4.92-8.01)
Bioptical Gleason score	
- 6	48 (54.6%)
- 7 (3+4)	27 (30.7%)
- 7 (4+3)	3 (3.4%)
- 8	9 (10.2%)
- 9	1 (1.1%)
cT	
- cT1c	51 (58%)
- cT2a	26 (29.5%)
- cT2b	8 (9.1%)
- cT2c	2 (2.3%)
- cT3a	1 (1.1%)
D'Amico risk classification	
- Low risk	40 (45.4%)
- Intermediate risk	35 (39.8%)
- High risk	13 (14.8%)

Table 2.
Patient pathological data.

Parameter	Value
Prostatic volume (cc)	(30.84; 21, 5-44, 75)
Prostatic weight (gr)	51; 36-67)
pT	
- pT2a	11 (12.5%)
- pT2b	37 (42.1%)
- pT3a	28 (31.8%)
- pT3b	12 (13.6%)
pN	
- pNx	17 (19.3%)
- pN0	66 (75%)
- pN1	5 (5.7%)
Gleason score	
- 6	10 (10.4%)
- 7 (3+4)	30 (34.1%)
- 7 (4+3)	20 (22.7%)
- 8	19 (21.6%)
- 9	9 (10.2%)
Tumor site	
- Base	14 (15.9%)
- Other sites	74 (84.1%)
Basal PSM	
- Present	5 (35.7%)
- Absent	9 (64.3%)
pT in patients with basal PSM	
- pT3a	2 (40%)
- pT3b	3 (60%)
pN in patients with basal PSM	
- pN0	2 (40%)
- pN1	3 (60%)
Gleason score in patients with basal PSM	
- 8	3 (60%)
- 9	2 (40%)
Multiple PSM in patients with basal PSM	
- Present	88 (100%)
- Absent	0 (0%)
Continuous solutions of specimen external capsule due to surgery	
- Present	0 (0%)
- Absent	88 (100%)

stage of lymph node involvement as pN0 in 2 cases (40%) and pN1 in 3 cases (60%); a Gleason score at specimen of 8 in 3 cases (60%) and 9 in 2 cases (40%); multiple PSM. Nobody had alterations or continuous solutions of specimen external capsule, attributable to surgical technique of bladder neck preservation. The median time to cystography was 6 days (4.5-14). In one case, there was anastomosis urinary leakage at cystography (1.13%).

DISCUSSION

The bladder neck preservation spares the internal sphincter, which is responsible for passive continence, and results in earlier return to continence and lower rates of post-prostatectomy incontinence (25-27). Moreover, this surgical technique spares the zone of urothelium coaptation and provides primary resistance to the urine to maintain post-prostatectomy continence (17). Thus, the BNP is a surgical factor contributing to PPI, act-

ing on two anatomic components influencing PPI. The other anatomic components are the targets of several surgical procedure, as supporting structures of the membranous urethra are the targets of anterior fixation or posterior reconstruction, as the neural components are the targets of nerve-sparing surgery.

Therefore, the continence recovery after RP is multifactorial and its achievement is due to several surgical approaches and not exclusively to a single surgical procedure. For this reason, in our study, it was not investigated the continence outcome.

The current study investigates the surgical and pathological outcome of BNP during RARP. In fact, the potential risk of bladder neck PSM may prevent the usage of the BNP.

Nowadays, this topic is controversial; some authors support that BNP may raise the bladder neck PSM (8, 29), contrarily, a meta-analysis (30) and other studies (31-36), support that the BNP would not compromise the oncological control of disease and that the mini-invasive approach, in particular RARP, and the best imaging diagnostic tools may allow a more safe procedure.

To address this controversy, we have evaluated in our study the presence of alterations or continuous solutions of specimen external capsule, attributable to the surgical technique of BNP, by microscopic and macroscopic pathological analysis. In our series, no specimen exhibited alterations or continuous solutions of specimen external capsule, referring to the surgical technique of BNP.

However, in 5 of the 14 cases (35.7%) with basal tumor, there were bladder neck PSM. Evaluating the pathological features of these cases, it was shown an extraprostatic extension of disease (pT3a-3b), a low grade of disease differentiation (G.S. 8-9), a lymph node involvement in more part of them, multiple PSM and not exclusive of BN; therefore, all patients with bladder neck PSM showed unfavorable pathological features.

According to *Golabeck* (34), the potential risk of bladder neck PSM would be linked to neoplasia with extraprostatic extension and a low grade of disease differentiation.

Our study shows that BNP during RARP doesn't cause alterations or continuous solutions of specimen external capsule, attributable to the surgical technique of bladder neck preservation, by microscopic and macroscopic pathological analysis, and that the bladder neck PSM are linked to neoplasia with adverse pathological features, rather than the BNP. Moreover, all case with bladder neck PSM showed multiple PSM, and, therefore, the PSM would be present regardless of BNP.

There are several limitations to this study. Although the data on our patients are collected prospectively, there isn't a control group, the patients are not randomized, and the number of patients is weak. Moreover, the BN approach was decided intraoperatively. Thus, it is possible that patients were selected according to individual features and technical considerations encountered intraoperatively. Cases of large prostate, prominent middle lobe or more difficult dissection would likely be spared the BNP approach.

CONCLUSIONS

The BNP during RARP is a safe oncological procedure resulting in a good functional outcome, about post-prosta-

tectomy continence, working on two anatomic components responsible for post-prostatectomy continence. The bladder neck PSM are linked to neoplasia with adverse pathological features, rather than the BNP.

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Conflict of interest: The authors declare no potential conflict of interest.