Narrowing of the Dorsal Vein Complex Technique during Laparoscopic Radical Prostatectomy: A Simple Trick to Simplify the Control of Venous Plexus

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Purpose: The control of the Dorsal Venous Complex (DVC) is crucial to the recovery of urinary continence during Laparoscopic Radical Prostatectomy (LRP). The size of DVC may affect the venous control. We developed a trick to simplify the suturing of the DVC.

Materials and Methods: Forty-seven patients with localized prostate cancer were divided into two groups: group 1 (n = 24) underwent LRP with a conventional ligature of DVC, and in group 2 (n = 23) the venous control was done with "Narrowing" of DVC technique (N-DVC). Our technique involves maintaining pressure on a metallic urethral sound inserted into the urethra, just at the time of ligature. The width of DVC in group 2 was measured before and after applying the technique. The numbers of attempts to place the stitch adequately were recorded and compared in both groups. The demographic and perioperative data, perioperative data and results were compared retrospectively.

Results: Operation time, estimated blood loss, prostate weight, positive surgical margins rates and potency results showed no significant differences between the groups. The immediate 1-month, and 3-month continence rates were significantly greater in group 2 (30.4% vs. 12.5%, *P* = .048; 73.9% vs. 50%, *P* = .037, respectively). For all patients in group 2, width of DVC decreased and the ligation stitch was effective at the first attempt. In 37.5% of patients in group 1, the controlling of the DVC was obtained in more than one attempt.

Conclusion: The N-DVC simplifies the control of DVC during LRP and may contribute to the early recovery of continence.

Keywords: prostatic neoplasms; surgery; laparoscopy; ligation; methods; prostatectomy; adverse effects; sutures.

INTRODUCTION

Robot Assisted-Radical Prostatectomy (RARP) and Laparoscopic Radical Prostatectomy (LRP) are usually applied in the treatment of organ confined prostate cancer. During these surgeries, an anatomical approach for management of the Dorsal Venous Complex (DVC) is crucial to recover urinary continence, control bleeding and ensure precise apical dissection.[1,2] The urethral sphincter is covered by the central portion of DVC, and its veins run in parallel. Sutures are employed usually to control the venous plexus, but the depth of the stitch for ligation cannot be clearly visualized. Thus, suturing may lead to injury of the muscle fibers of the rhabdosphincter, which could affect the functional outcome of continence.[3-6] The critical points in the control of the DVC include the proper identification of the plane between the venous plexus, urethra and sphincter and the full incorporation of the veins without injury to the sphincter muscle.[7] However, several factors increase the difficulty of controlling the DVC, including the following: variability of the pelvic space, the anatomy of the pubic bone, the different morphologies of the prostatic apex, the presence of large prostate, and plentiful amount of fatty tissue in Retzius space in obese patients.[8-10] In these cases, the ligature of the venous plexus may be more difficult because the anatomical space between the prostatic apex and pubic bone may be short and it is uncomfortable to place stitches. Several efforts to optimize the control of the DVC have been made by applying various techniques and devices.[3-5,9,11-15] Extremely large venous plexus can make the surgical procedure more difficult by demanding vascular control.[16] We developed a simple maneuver named "Narrowing" of Dorsal Vein Complex technique (N-DVC) in order to get better exposure and optimal vision with the aim to simplify the suturing of venous plexus, mobilizing the urethra by a metallic urethral sound. We observed that pushing down urethra with a metal sound deforms apical tissues and produces anatomical changes that can improve vision. Employing the view of the 30° scope, these small changes may optimize the vision to simplify DVC ligation. The perioperative parameters and functional outcomes were compared with those of conventional suture in a non-randomized retrospective study. Our main objective was to present our technique and evaluate its potential benefits in the ligation of DVC.

MATERIALS AND METHODS

Forty-seven consecutive patients who had clinically localized prostate cancer with indication for LRP were included in the study. The patients were divided into two groups: group 1 (n = 24) underwent LRP with conventional ligature, and group 2 (n = 23) underwent ligature with N-DVC. All patients were enrolled consecutively without eligibility criteria and they were analyzed in a retrospective, non-randomized and descriptive study. The

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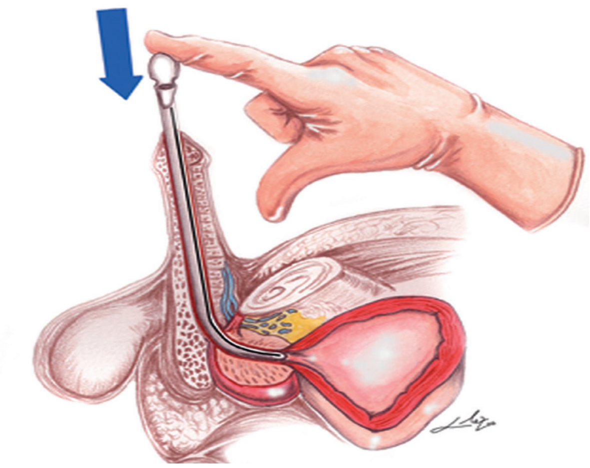

Figure 1. A metallic urethral sound is inserted into the urethra, and the assistant's hand maintains pressure on the distal tip of this device in a posterior direction, just at the time of passing of the ligature stitch of venous plexus, displacing the urethra posteriorly and causing stretching of dorsal venous complex.

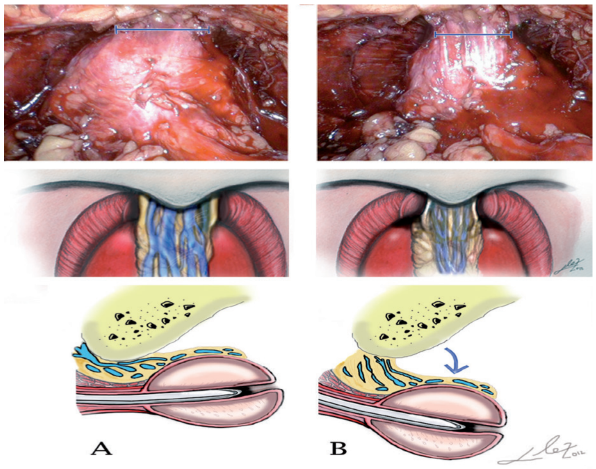

Figure 2. Pushing down the urethra with a metallic urethral sound results in the narrowing of the dorsal venous complex. **(A)** Intraoperative, schematic and sagittal views of the dorsal venous complex in a conventional position; **(B)** Intraoperative, schematic and sagittal views of the dorsal venous complex narrowed while the urethra was pushed down.

demographic and perioperative variables were recorded: age, serum prostate specific antigen (PSA), Gleason score, stage, body mass index (BMI), operation time, estimated blood loss, specimen prostate weight and surgical margin. Included patients were followed up for 12 months. The surgical videos of all patients were recorded and reviewed with emphasis on the step of DVC ligation. Two items were recorded to evaluate the impact on the simplification of the ligature:

1. The width of DVC: The decrease in the width of the DVC produced by urethral sound wasconsidered as criteria of simplification. Screen shots were taken before and after applying the maneuver, and the venous plexus was measured in each situation. The pictures stored in compressed JPG (Joint Photographic Experts Group) and the Adobe Photoshop® program was used to measure the width of DVC mark was placed. In order to take photos at the same distance, a mark on the outside of the endoscope, which provide guidance for the assistant to hold the instrument immobile during capture. DVC measurements were standardized as a percentage of decrease of the width. Although measurement provides some imprecision, the decrease of the width of DVC is obvious and unquestionable to the eye, and was used in an effort to standardize and to quantify the impact of the technique.
2. The attempts to place the stitch: The numbers of attempts to place the stitch in both groups were recorded.

Continence and potency were evaluated during follow up at 1, 3, 6, 9 and 12 months after surgery. The continence was defined as the absence of the requirement of wearing

Table 1. Demographic and perioperative characteristics of study subjects.*

Variables	Group 1 (n = 24)	Group 2 (n = 23)	*P* Value
Age (years)	64.04 ± 6.10	62.05 ± 6.96	NS
PSA (ng/mL)	7.32 ± 3.24	9.72 ± 4.31	NS
Gleason score	5.95 ± 0.97	6.2 ± 0.89	NS
Stage, no (%)			
T1	15 (62.5)	17 (73.9)	NS
T2	9 (37.5)	6 (26.0)	NS
BMI (kg/m^2)	26.02 ± 3.87	26.96 ± 2.92	NS
Operation time (min)	201 ± 33.20	196.75 ± 32.69	NS
Blood loss (mL)	553 ± 338	580 ± 295	NS
Prostate weight (g)	45.59 ± 13.53	49.16 ± 19.11	NS
Positive surgical margins (%)	20.83	21.73	NS
Potency (%)	66.6	61.53	NS

Abbreviations: NS, not significant; PSA, prostate specific antigen; BMI, body mass index.
* Data are presented as mean ± standard deviation.

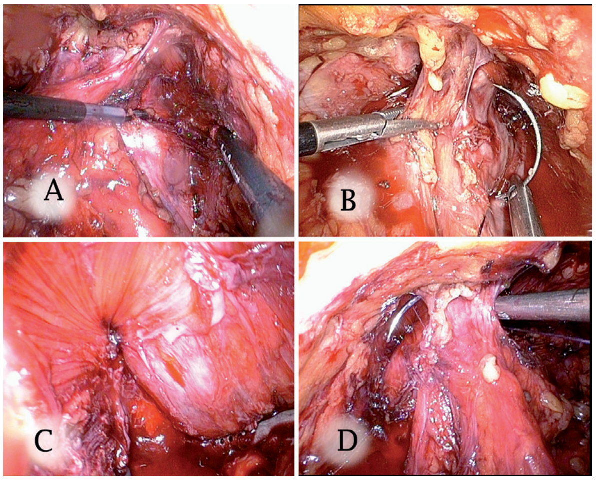

Figure 3. (A and B) A 30° scope was placed in the lateral view to enhance the visualization of the anatomical structures and guide needle insertion during suturing; **(C and D)** The scope was switched to the contra-lateral position to visually control the exit of the needle tip in the correct anatomical location.

pads. The groups were retrospectively compared.

Statistical Analysis

The statistical tests used were student's *t*-test for continuous variables and chi-squared analysis for categorical variables (Stata Corp, Stata Statistical Software, Version 10.1, Stata Corporation, College Station, Texas, USA). A *P* value of < .05 was considered to be statistically significant.

Technique

The 4-trocar LRP transperitoneal technique was applied in all patients. A 30° scope was employed in both groups. Dissection of the Retzius space was performed to expose the puboprostatic ligaments; and the endopelvic fascia was bilaterally incised. A blunt dissection of the periapical tissues of the gland was performed to expose the DVC. A midprostatic suture was placed to prevent venous back-bleeding. The puboprostatic ligaments were preserved in all patients. In group 1 (conventional ligature), the control of DVC was done with a figure-of eight suture employing a polyglactin suture on a CT-1 needle. In group 2, the N-DVC technique was applied. Our technique involves a metallic urethral sound that is inserted into the urethra, and the assistant's hand maintains pressure on the distal tip of this device in a posterior direction, just at the time of passing the ligature stitch of venous plexus (**Figure 1**).

It produces cephalic displacement of the prostate, and simultaneously the urethra is pushed down and the DVC is stretched (**Figures 2A and 2B**).

A 30° scope was placed in the lateral view to enhance the visualization of the anatomical structures and guide needle insertion during suturing[10,14] (**Figures 3A and 3B**). After the suture passed, the scope was switched to the contralateral position to visually control the exit of the needle tip in the correct anatomical location (**Figures 3C and 3D**), and finally the threads are knotted like a figure-of-eight suture over the venous plexus. Once again, during the athermal transection of the DVC, the assistant repeated the maneuver to avoid injury to the sphincter during cutting. At the end of the cut, the anterior aspect of the urethra was immediately exposed by the presence of the urethral device, which expanded its lumen (**Figures 4A and 4B**). The urethra was incised at the prostatic apex to expose the metallic urethral sound. The prostate was dissected with a nerve-sparing technique without using thermal energy in a retrograde approach. The vesico-urethral anastomosis was performed in a running fashion using absorbable polyglyconate self-retained barbed suture.

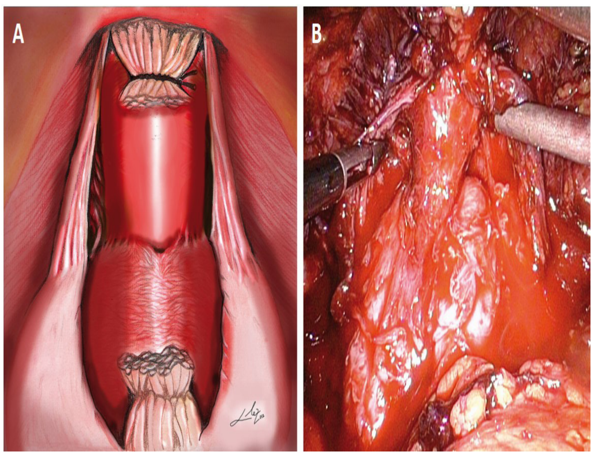

Figure 4. At the end of the cut of the dorsal venous complex, the anterior aspect of urethra was immediately exposed by the presence of the urethral device, which expanded its lumen.**(A)** Schematic view; **(B)** Intraoperative view.

Results

The two groups were comparable in terms of age, serum PSA levels, Gleason score, stage and BMI. The perioperative parameters (operation times, estimated blood loss, specimen prostate weight and positive surgical margins rates) and functional potency results showed no significant differences between the groups (**Table 1**). In group 1, 29.16% of the patients were transfused, which was 26.085% in group 2. The immediate continence included cases that were continent after catheter removal 1 month after surgery. The continence results are shown in **Table 2**. The early continence rates (immedate and 3 months) were significantly greater in group 2 than in group 1. At 6 and 12 months, the continence rates were similar in both

Table 2. Continence results in study groups.

Continence	Group 1(n = 24)	Group 2 (n = 23)	*P* Value
Immediate (1 month)	3 (12.5)	7 (30.4)	.048
Three months	12 (50)	17 (73.9)	.037
Six months	18 (75)	20 (86.9)	NS
Nine months	20 (83.3)	21 (91.3)	NS
Twelve months	22 (91.6)	22 (95.6)	NS

Abbreviation: NS, not significant.
* Data are presented as no (%).

groups. There were no conversions or complications attributable to the use of the urethral sound. Positive surgical margin rates (group 1, 20.83% and group 2, 21.73%) and potency functional results at 12 months (group 1, 66.6% and group 2, 61.53%) showed no significant differences between groups. Our study did not evaluate the oncological results of the N-DVC technique, whereby location of the surgical margins were not analyzed.

In all patients of group 2, the N-DVC technique causes modifications in the shape of venous plexus and decreases its size by up to 20% of original size. The ligation stitch was positioned properly at the first attempt in group 2, and 9 patients (37.5%) in group 1 required more than one attempt. The N-DVC technique was successful in all patients of group 2, and we did not need conversion to "conventional" ligature.

DISCUSSION

The adequate control of the DVC ensures bloodless surgery and optimizes the conditions for an accurate apical dissection.[15] The DVC is commonly controlled by a single suture prior to the apical dissection; however, to avoid bleeding, the suture may be placed deep, which could damage the rhabdosphincter and affect the recovery of urinary continence.[3,4] Occasionally, the suture ligation of the DVC may be a challenge, especially for a novice laparoscopist,[13] in obese patients[8] or those with adverse anatomical characteristics, such as a deep and narrow pelvis, a bulky prostate, a prominent apex, or exostosis of the symphysis pubis. Jeong and colleagues[16] showed that DVC varies in sizes among individuals, and they found it is a significant predictor for recovery of the continence and the incidence of transfusions. These authors explain that a large DVC can make the surgical procedure more difficult by demanding vascular control. We developed a simple surgical trick to get better exposure and optimal vision to simplify the control of the DVC. In our technique the prostatic apex moves away from the pubic bone, which slightly increases the workspace while the DVC elongates, narrows and its anatomical boundaries are defined more clearly. Furthermore, employing the view of the 30° scope, these small changes optimize the vision below the pubic bone and may simplify DVC ligation. In our opinion, it is obvious that the control of a narrow venous plexus is easier and the passage of the needle is faster than a larger size DVC. Subjectively, we observe that our technique makes a more comfortable control of the DVC. Additionally, the N-DVC technique keeps away the urethra of the passage of the needle, which may reduce the risk of injuring the sphincter and favorably affect early continence recovery. During the transition of the DVC, the maneuver is repeated, avoiding injury to the sphincter. Previously, several authors have reported using a metallic urethral sound to displace the urethra to avoid the inadvertent transgression of the urethra by devices used for ligation,[9,13] and many authors routinely use a urethral sound during LRP. Our trick not only involves the insertion of a urethral sound, but also includes maintaining pressure on it to push down the urethra and modify the shape of the DVC to better recovery of continence. Several alternatives have been proposed to control the DVC. Lei and colleagues,[3] Porpiglia and colleagues,[4] Guru and colleagues[5] and Sasaki and colleagues[12] reported using athermal DVC control prior to apical dissection followed by a subsequent or selective ligation during LRP or RARP. They reported shorter operation times, reduced apical positive surgical margins and faster recovery of continence. Moreover, some automated devices have been used to effectively control the DVC, as reported by Nguyen and colleagues[9] and Wu and colleagues,[11] who used the endovascular stapler. Abreu and colleagues [13] employed an automated system with a titanium knot during ligation of the venous plexus. Recently, Tüfek and colleagues[15] described a novel technique to control the DVC during RARP and demonstrated a shorter operation time and quicker recovery of continence using a bulldog clamp.

The critical point in control of DVC is the proper identification of the plane between the venous plexus, urethra and sphincter through accurate visualization of the anatomical structures; this identification is crucial to prevent bleeding or injury to the sphincter.[7,10] The N-DVC technique modifies the shape of the venous plexus and exposes the edges more clearly, simplifying the identification of anatomical structures. Sasaki and colleagues[14] demonstrated the impact of a lateral view apical dissection in LRP on the reduction of surgical margins and the recovery of postoperative continence. For procedures with restricted views using a rigid scope, they significantly improved the view of the apical structures by inserting the scope at McBurney's point. Tewari and colleagues[10] reported the advantages of circumferential visualization of the prostatic apex and membranous urethra for precise dissection by employing a 30° scope during RARP. In our study, we obtained similar perception because the lateroapical view of the 30° scope improved the visualization of the anatomical aspects of the prostatic apex and apical tissues that were not observed with the rigid 0-degree scope. Furthermore, the N-DVC technique in combination with the use of the 30° scope optimized the identification of anatomical structures allowing placement of the stitch under excellent visual control.

Our manuscript has several limitations. It is a retrospective, descriptive and non-randomized study. The number of patients is very small and the groups were not matched. Furthermore, there may be many sources of potential bias or imprecision, and more studies involving larger numbers of patients, with statistical analysis are needed to establish solid conclusions. The N-DVC technique did not report better results with respect to rates of bleeding or transfusion, nor was it effective to shorten the operation time or improve the status of surgical margins, however, it is an effective and very simple trick which may improve the exposure and simplify the ligature of DVC, that is inexpensive, safe, without risks, not time consuming, may be applicable in all scenarios and may contribute to the recovery of continence.

CONCLUSION

The N-DVC technique simplifies the control of the DVC during LRP and may contribute to the early recovery of continence because it may reduce the risk of injuring the sphincter.

CONFLICT OF INTEREST

None declared.

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