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CLINICIAN'S WORKSHOP

Prostate Cancer

A technique of pretightening dorsal vein complex can facilitate laparoscopic radical prostatectomy

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The ligation of dorsal venous complex (DVC) is a very important procedure during laparoscopic radical prostatectomy (LRP). Inaccurate DVC ligation may lead to severe bleeding or postoperative incontinence. We, therefore, designed the DVC pretightening technique to facilitate this procedure. The 32 involved patients with localized prostate cancer underwent LRP between July 2017 and October 2018. All of the patients received DVC pretightening technique. A laparoscopic intestinal clamp was used to narrow and strain DVC. The needle passage was limited between the bone and clamp. The ligation time, DVC-related blood loss, and continence data were recorded. The ligation of DVC in 32 patients was performed with DVC pretightening technique. Every suture was completed with one attempt. The mean ligation time was 2.7 ± 1.0 min. The DVC-related blood loss was 2.0 ± 1.3 ml. The 3-month continence rate was 81.3% (26/32). Positive margin rate was 9.4% (3/32). In conclusion, the DVC pretightening technique simplified the ligation of DVC during LRP. It is a safe and reliable technique. However, large-sample randomized controlled trials are still required to confirm the advantage of the new method in improving mean ligation time, DVC-related blood loss, continence rate, and positive margin rate.

Laparoscopic radical prostatectomy (LRP) is usually applied in treating organ-confined prostate cancer. The ligation of dorsal venous complex (DVC) is a very important procedure during LRP. Inaccurate

ligation of DVC may lead to severe bleeding,¹ postoperative incontinence, or imprecise apical dissection.^{2–4} The venous plexus in DVC is run in parallel with certain width. Thus, it is difficult to control needle passage in suturing DVC. In addition, the depth of the stitch for ligation cannot be clearly controlled. Suturing may lead to injury of the veins, rhabdosphincter, or urethra, which could affect operative vision and the functional outcome of continence. The positive surgical margin was often occurred on the apex. Therefore, the accurate apical dissection is the most important step in LRP.^{5,6} The satisfactory ligation of the DVC should control all of the venous plexus without injury to vein, apex, urethra, and sphincter.

However, in fact, the space of pelvic cavity is very limited. Prostatic apex is morphologically different. Some patients have large prostates or large venous plexus. These factors make the suturing of DVC very difficult. In some of cases, several attempts are usually required to position the ligation stitch, which consume much time and are hard to get ideal results.

Some doctors used titanium knot,⁷ endovascular stapler,⁸ or bulldog clamp⁹ to clip DVC. García-Segui and colleagues¹⁰ applied a metallic urethral sound to maintain pressure on urethra, just at the time of ligation. To a certain degree, the above methods simplify the DVC ligation.

To further facilitate the DVC ligation, we designed a new method that named “DVC pretightening technique.” This technique specially uses the intestinal clamp to tighten the DVC. It is a simple and cheap way to become the flat and broad plane of the DVC to a hunched and narrow one. Compared with conventional DVC ligation technique, the distance of needle passage is much shorter. Hence, it is very easy for the needle to pass

through the hunched and narrow DVC. In addition, the needle passage was limited between the pubic bone and intestinal clamp. In this way, the needle passage can be more easily controlled. Even if the prostate or venous plexus is very large during LRP, the DVC could be sutured accurately. In this study, the DVC was ligated with short time and less blood loss. The continence rate was 81.3% 3 months after operation.

PATIENTS AND TECHNIQUE

Between July 2017 and October 2018, consecutive LRPs were performed in 32 patients. Of which, 17 patients with high-risk prostate cancer received concomitant bilateral extended pelvic lymph node dissection (PLND). All the patients received DVC pretightening technique and completed at least 3 months of follow-up. The DVC-related blood loss, ligation time, and continence rate were recorded. The data were expressed as mean \pm standard deviations (s.d.) and percentage.

A five-port intraperitoneal approach was used. The bilateral endopelvic fascia was incised, and the dissection was continued in the plane between the prostate and the levator ani muscles. As the conventional ligation, the overlying tissues were swept from the DVC, and after that, the DVC pretightening technique was applied.

A laparoscopic intestinal clamp is placed through a 10-mm laparoscopic port that locates in the left side near the laparoscope (camera). The laparoscopic intestinal clamp was opened and the DVC was tucked in the clamp (**Figure 1a**). To ensure that it is freely mobile within the urethra and not caught in the clamp, a Foley catheter or urethral sound was used before the clamp was locked. Once this is confirmed, the laparoscopic intestinal clamp was locked to operate successive

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ligation of DVC. The needle was inserted from the right side to the left side. When the needle was inserted, the scope was changed to 30° left (Figure 1b). Clamped by the laparoscopic intestinal clamp, the flat and thick DVC became compact and thinner. The needles can transverse the DVC easily. The scope was changed to 30° right or down when the needle was withdrawn (Figure 1c). The point and direction of the suture can be controlled accurately under the good vision. We passed a 2-0 Stratafix® herded suture on a 36-mm needle between the DVC anteriorly and the urethra posteriorly. When we pulled the needle through the loop of the suture, the tying was locked automatically by the barbs on the suture (Figure 1d). To keep the thread tension, we did another stitch more proximally on the DVC. This procedure was to achieve safe ligation by increasing the traction of the barbed suture.

The baseline patient characteristics (age, PSA level, pathological Gleason score, and clinical stage) are shown in Table 1. The mean age was 69.6 ± 6.4 years. Operative outcomes are detailed in Table 2. The mean operating time was 139.8 ± 28.7 min and the mean estimated blood loss was 96.9 ± 45.4 ml. The mean DVC ligation time was 2.7 ± 1.0 min and the mean DVC-related blood loss (including DVC dissection and ligation) was 2.0 ± 1.3 ml. There was no massive hemorrhage and serious complication in all patients. No blood transfusions were required. Positive margin

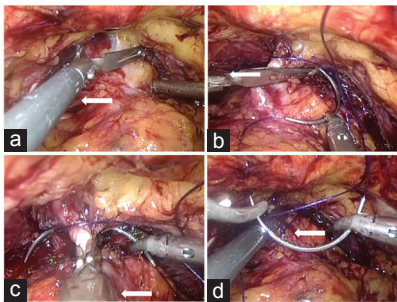


Figure 1: The procedure of DVC ligation with pretightening technique. (a) After the overlying tissues were swept from the DVC, the laparoscopic intestinal clamp (arrow) was opened and the DVC was tucked in the clamp. (b) The laparoscopic intestinal clamp (arrow) was locked to operate successive ligation of DVC. The needle was inserted from the right side to the left side. When the needle was inserted, the scope was changed to 30° left. (c) Clamped by the laparoscopic intestinal clamp (arrow), the flat and thick DVC become compact and thinner. The needles can transverse the DVC easily. When the needle was withdrawn, the scope was changed to 30° right or down. (d) The needle was pulled through the loop (arrow) of the suture and the tying was locked automatically by the barbs on the suture. DVC: dorsal venous complex.

rate was 9.4% (3/32). Three-month continence rate was 81.3% (26/32).

COMMENTS

Accurate ligation of the DVC is helpful to reduce blood loss and keep surgical field clear. It is a crucial procedure in LRP.^{11,12} The difficulty involved in ligation of DVC is to find the natural plane between DVC and urethra.¹³ Too superficial suture may injure the DVC and cause bleeding. Too deep suture may injure the urethra. To accurately pass the needle through this thin plane in a narrow space is challenging. In the past, many clinicians took effort to facilitate the ligation of DVC, but all efforts were impeded by consuming materials with high cost.^{7,8} Recently, we designed a simple and effective technique to make the shape changing of DVC. By using a laparoscopic intestinal clamp, the flat and broad DVC became thinner and hunched. It made the natural plane between DVC and urethra to be found easily. We used double suture method to ligate the DVC. With the DVC pretightening technique, every suture was completed for one attempt. The mean ligation time was only 2.7 min. DVC-related blood loss (including DVC

dissection and ligation) can be almost ignored. There were no massive hemorrhage and serious complications in all patients involved. After 3 months of follow-up, the continence rate was 81.3%. In this study, the DVC ligations in all patients were performed accurately and conveniently in a short time. Although the evidence from the study was not enough to verify that the DVC pretightening technique is better than conventional ligation, with little DVC-related blood loss, the new technique provides clear view during apical dissection and urethral division while potentially minimizing the external sphincter trauma and pinpointing the apical dissection. With the new technique, DVC ligation could never be a tough procedure. However, two limitations should be noted. At first, in this study, only 32 patients were included. However, the operations were performed by the same surgeon group. All the data were collected prospectively. The possible bias may be minimized. Second, no control group was set in this study. This small-sample prospective study is to introduce the modified technique. It is inappropriate to compare the prospective data of new method with retrospective data of conventional DVC ligation.

Although the new technique was proved safe and reliable in this study, its advantage in improving ligation time, blood loss, continence rate, and margin positive rate still requires further large-sample randomized controlled studies to confirm. In conclusion, the DVC pretightening technique can facilitate the ligation of DVC during LRP. It is a safe, convenient, and reliable technique.

COMPETING INTERESTS

All authors declare no competing interests.

AUTHOR CONTRIBUTIONS

WC and JMG contributed to concept of the study and design and technique of the procedure. JCZ, LX, and XYH collected the data. ZBX polished the manuscript. JMG and WC drafted, revised, and approved the manuscript. All authors read and approved the final manuscript.

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Table 1: Patient demographics (n=32)

| Characteristic | Value |
|---------------------------|----------|
| Age (year), mean±s.d. | 69.6±6.4 |
| PSA (n) | |
| 4-10 ng ml ⁻¹ | 13 |
| 10-20 ng ml ⁻¹ | 11 |
| >20 ng ml ⁻¹ | 8 |
| Gleason score (n) | |
| <7 | 8 |
| 7 | 13 |
| 8-10 | 11 |
| T stage (n) | |
| T1 | 6 |
| T2 | 16 |
| T3 | 10 |
| N stage (n) | |
| N0 | 30 |
| N1 | 2 |

PSA: prostate-specific antigen; s.d.: standard deviation

Table 2: Operation outcome

| Operation outcome | Value |
|---|--------------|
| Operating time (min), mean±s.d. | 139.8±28.7 |
| Estimated blood loss (ml), mean±s.d. | 96.9±45.4 |
| DVC-related blood loss (ml), mean±s.d. | 2.0±1.3 |
| Mean DVC ligation time (min), mean±s.d. | 2.7±1.0 |
| Positive margin (n) | 3 |
| Suture of catheter (n) | 0 |
| Continence rate in 3 months, n (%) | 26/32 (81.3) |

DVC: dorsal venous complex; s.d.: standard deviation



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