



Use of a linear stapler for urethral and dorsal vein complex transection during laparoscopic total pelvic exenteration in rectal cancer

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Introduction

Dorsal vein complex (DVC) and urethral transection during total pelvic exenteration (TPE) is time-consuming, technically challenging, and associated with a high rate of hemorrhage. Although laparoscopic surgery is associated with less intraoperative blood loss during TPE [1], it is still technically challenging to perform in DVC and urethral transection. Techniques for transecting the DVC during radical prostatectomy have been reported [2–4]. Concerning the surgical technique of TPE for rectal malignancy, only limited studies have described the technique used for DVC and urethral transection. Hayashi et al. reported that the urethra could be successfully transected using a linear stapler, but the DVC was not successfully transected [5]. Techniques using a linear stapler for transection of the DVC and urethra have not been described.

We describe our simple technique for transecting the DVC and urethra easily and without significant bleeding during laparoscopic TPE in rectal cancer.

Case description and operative technique

The tumor was suspected to have invaded the prostate and be located 2.0 cm from the anal verge (Fig. 1a–d). With the patient under general anesthesia, we performed laparoscopic TPE with urinary diversion.

After placing the patient in the Trendelenburg position, the laparoscopic procedure was performed using six trocars. After medial-to-lateral retroperitoneal dissection and division of the inferior mesenteric artery, the sigmoid colon was transected using a linear stapler. Posterior dissection was performed at the level of the levator ani. Both ureters were mobilized and divided at the level of the ureterovesical junction. Anteriorly, the Retzius and paravesical spaces were exposed at the level of the endopelvic fascia. Bilateral dissection was performed along the internal iliac vessels, the branches from these vessels were divided, and the lateral endopelvic fascia was exposed. The DVC was exposed using the laparoscopic approach, but this easily bleeding area was not touched (Fig. 2). After the perineal incision was made, the endopelvic fascia, levator ani, and ischioanal fossa were dissected using a combined abdominal and perineal approach. Finally, the DVC and urethra were completely exposed. A linear stapler (Powered ECHELON FLEX™ GST System, 60-mm blue cartridge; Ethicon, Cincinnati, OH, USA) was inserted from the perineal aspect along the pubis with guidance from the perineal operator's fingers and the abdominal operator's laparoscopic forceps (Figs. 3a, 4a). The jaw of the linear stapler was closed carefully and slowly in order to compress the DVC and urethra within 1 min, followed by full closure, which was performed within 1 min; additionally, en bloc transection of the DVC and urethra was performed along the pubis (Figs. 3b, 4b). A specimen of the tumor was extracted through the extended umbilical incision. After primary perineal wound closure, the ileal conduit was constructed intracorporeally through the lower abdominal incision, and a sigmoidostomy was created.

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Fig. 1 Preoperative imaging. Colonoscopy reveals advanced low rectal cancer (a). Computed tomography (CT) and magnetic resonance imaging (MRI) reveal the tumor on the anterior side with suspected invasion of the prostate. CT, T2-weighted MRI, and diffusion-weighted MRI scans are shown in b–d, respectively. White arrows indicate the tumor. Red arrowheads indicate the prostate

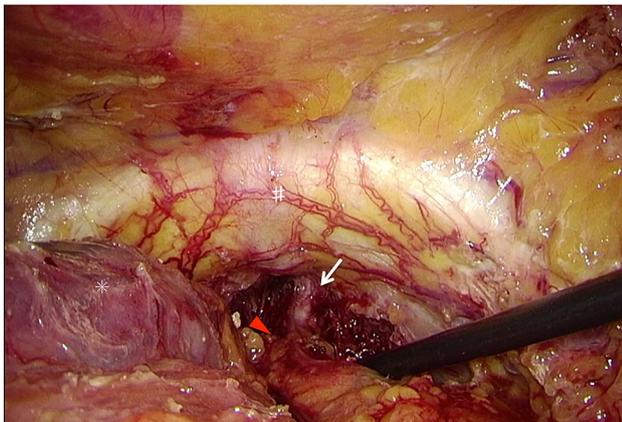
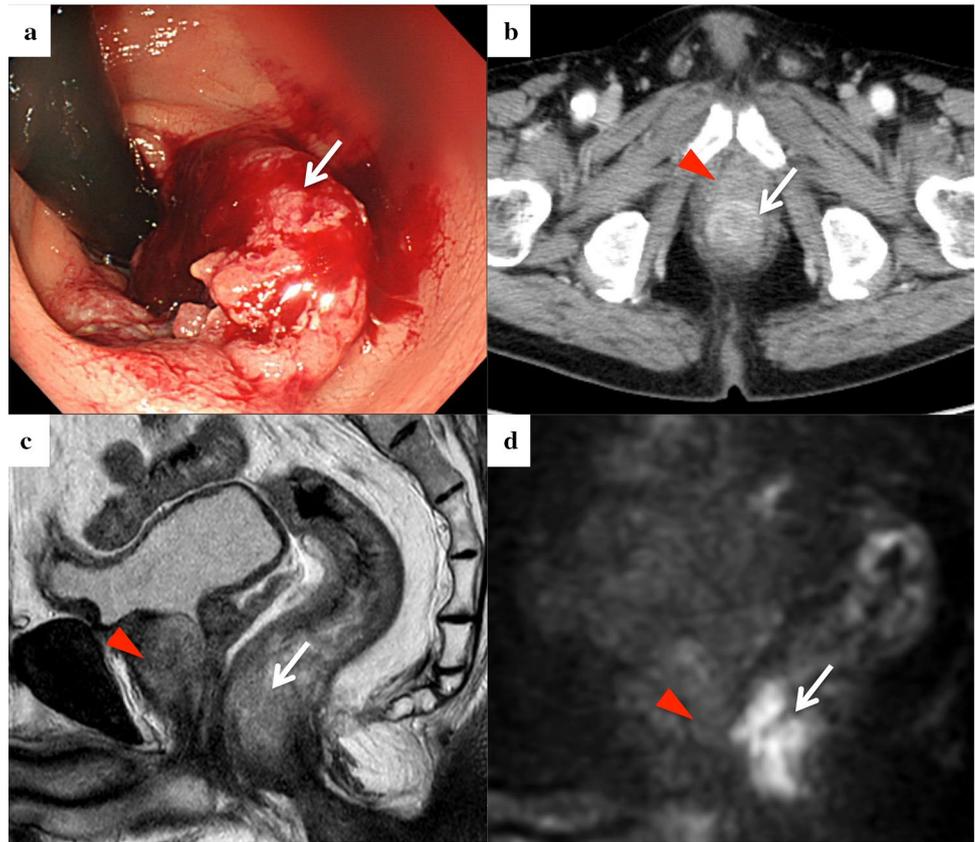


Fig. 2 Laparoscopic view of the anterior dissection of the genitourinary organs. The asterisk and hashtag indicate the bladder and pubic bone, respectively. The white arrow and red arrowhead indicate the dorsal vein complex and prostate, respectively

Results

The total operating time was 513 min, and the estimated blood loss was 629 mL. Postoperatively, the patient developed pelvic dead space infection; he responded to conservative treatment with antimicrobial therapy. His

postoperative hospital stay was 47 days. The final pathological result showed pT4 (prostatic invasion) and positive lymph node metastasis. The circumferential resection margin (CRM) of the tumor was negative (5 mm). No disease recurrence was detected during the 7-month follow-up.

Discussion

For urological malignancies, various tricks for transecting the DVC have been described [2–4]. In contrast to pelvic exenteration for rectal malignancies, urological operations have been required to maintain urinary continence, which is one of the high priority issues after radical prostatectomy. However, this issue seems to not be crucial in pelvic exenteration with urinary diversion for rectal malignancies; it is more important to improve the intraoperative outcomes.

We described the technique of using a linear stapler for DVC and urethral transection. Similar to our experience, Wu et al. also showed the efficacy of staple ligation for only DVC transection for radical prostatectomy [4]. This technique resulted in shorter operative times and less blood loss than the suture ligation technique. The technique for transecting the DVC using a linear stapler can result in a shorter operative time and less blood loss in TPE for rectal malignancies. Hayashi et al. reported that the urethra could be successfully

Fig. 3 Operative procedure of dorsal vein complex (DVC) and urethral transection. **a** A linear stapler is inserted along the pubic bone from the perineal aspect, and its jaw is closed carefully and slowly to compress the DVC and urethra. **b** The resection stump of the DVC and urethra is shown without substantial bleeding

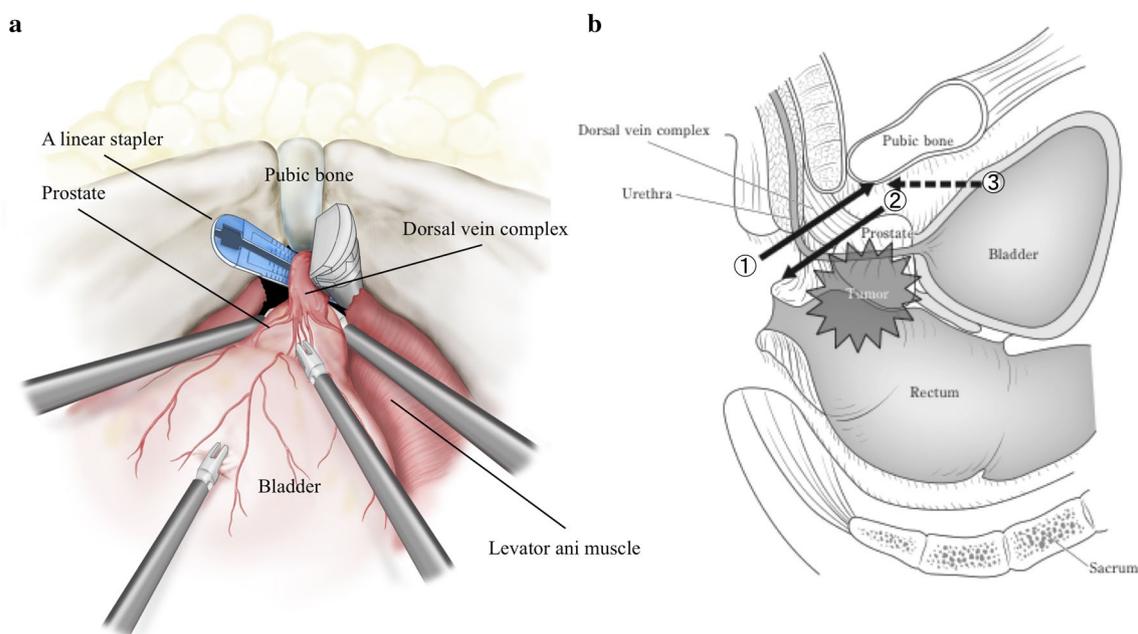
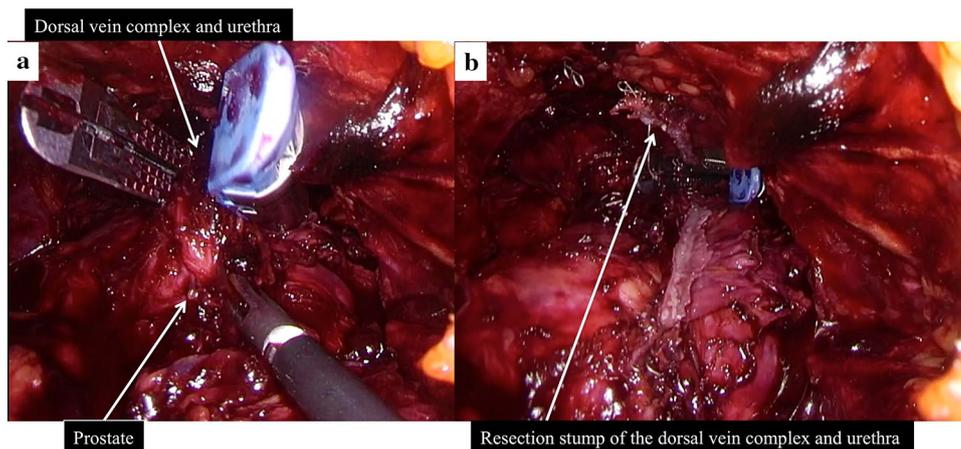


Fig. 4 Schema of the technique for transecting the dorsal vein complex (DVC) and urethra. **a** Schema of the laparoscopic view in urethral and DVC transection performed using a linear stapler from the perineal aspect. **b** Schema of the sagittal view of the transection line

transected using a linear stapler, although the DVC could not be transected using a linear stapler because of its thickness [5]. The DVC is a thick structure, but it seems practical to transect it without bleeding by using a linear stapler to carefully close and slowly compress the DVC and urethra within a few minutes.

In our case, we inserted a linear stapler from the perineal aspect to transect the DVC and urethra. The perineal approach seems to be better than the abdominal approach for ensuring a negative CRM of the tumor near the DVC and urethra. Surgical forceps inserted from the abdominal

from both the abdominal and perineal aspects. Transection from the perineal and abdominal aspects is indicated by lines 1 and 2, respectively. The difficult-to-perform dissection along the distal part of the pubic bone from abdominal aspect is indicated by line 3

aspect are likely to be directed dorsally because of the pubic bone, especially during laparoscopic surgery. Consequently, the direction of the dissection line can be close to the tumor. However, surgical forceps can be easily inserted from the perineal aspect and directed along the pubic bone, and with this approach, it seems easier to obtain a negative CRM of the tumor near the DVC and urethra (Fig. 4b). Even if transection of these structures is performed from the perineal aspect along the pubic bone, it seems difficult to achieve hemostasis after transection once bleeding has occurred from the DVC and urethra near the pubic bone. Therefore,

transection of the DVC and urethra from the perineal aspect with the use of a linear stapler can be effective in terms of hemostasis and a negative CRM for rectal malignancies. If a linear stapler is not used from the perineal aspect, bleeding may easily occur, and it may be difficult to achieve hemostasis.

Conclusions

The use of a linear stapler for DVC and urethral transection during laparoscopic TPE performed for advanced low rectal cancer is a simple, useful method associated with minimal bleeding. Transection of these structures from the perineal aspect may have a potential benefit in the status of a negative CRM of the tumor.

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Data availability The datasets generated during and analyzed during the current study are available from the corresponding author (YN) on reasonable request.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the insti-

tutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the institutional review board.

Informed consent Informed consent was obtained from the patient for publication and presentation of this article and accompanying images.

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