Case Report

Robot-assisted radical cystectomy using real-time transrectal ultrasound guidance in a patient who had radical prostatectomy and salvage external beam radiation therapy

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Abbreviations & Acronyms
AUC = area under the curve
BCG = bacille Calmette–Guerin
BUN = blood urea nitrogen
CIS = carcinoma in situ
EBRT = external beam radiation therapy
eGFR = estimated glomerular filtration rate
MIBC = muscle invasive bladder cancer
ORC = open radical cystectomy
PC = prostate cancer
PFS = progression-free survival
PSA = protein-specific antigen
RARC = robot-assisted radical cystectomy
RARP = robot-assisted radical prostatectomy
RC = radical cystectomy
RP = radical prostatectomy
RRP = radical retropubic prostatectomy
TRUS = transrectal ultrasound
TURBT = transurethral resection of bladder tumor

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Introduction: Radical cystectomy for patients who previously underwent both radical prostatectomy and prostatic bed radiation is technically challenging.
Case presentation: A 78-year-old man with a history of radical prostatectomy and salvage radiation for prostate cancer was referred to our hospital for radical treatment of bladder cancer. After two cycles of neoadjuvant chemotherapy, he underwent robot-assisted radical cystectomy with real-time transrectal ultrasound guidance during dissection of the rectovesical space to minimize the risk of rectal injury. There were no perioperative adverse events.
Conclusion: Intraoperative real-time transrectal ultrasound guidance could assist surgeons to safely perform the dissection of the rectovesical space in the surgically high-risk patient.

Key words: radical prostatectomy, rectal injury, robot-assisted radical cystectomy, salvage external beam radiation therapy, transrectal ultrasound.

Keynote message

Transrectal ultrasound guidance during robot-assisted radical cystectomy can confirm where forceps have been tapped, which allows us to identify the anatomical structures that is dissected at that time. Transrectal ultrasound guidance minimizes the risk of rectal injury in the high-risk post-prostatectomy and/or post-EBRT patients.

Introduction

RARC has been the standard surgical approach with less bleeding, lower transfusion rate, and fewer 90-day complications compared to ORC.[1–3] However, RARC in patients with a history of RP and/or pelvic radiation therapy has been considered difficult with a high risk of surgical complications due to pelvic adhesion.

Hereby, we experienced RARC in the patient who had previously undergone RRP followed by EBRT for recurrent PC. To minimize the risk of rectal injury, we used TRUS guidance during the dissection of the rectovesical space, which potentially assist to perform RARC safely with minimizing surgical complications.

Case report

A 60-year-old Japanese man received RRP for PC. Two years after the RRP, he received androgen deprivation therapy plus salvage EBRT for biochemical recurrence of the PC. Although the salvage EBRT successfully treated local recurrence of prostatic surgical bed, he complained asymptomatic gross hematuria and positive urine cytology 13 years after the RRP. He underwent TURBT with pathological findings of CIS. Despite initial intravesical BCG, CIS recurred 4 years after the initial TURBT. BCG rechallenge followed by three times BCG maintenance therapy was ineffective and urine cytology remained positive. He was

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referred to our hospital at the age of 78 for radical treatment of BCG refractory bladder cancer.

He had a history of the surgery for a left inguinal hernia. His initial laboratory values were as follows: BUN, 29.1 mg/dL; serum creatinine, 1.37 mg/dL; eGFR, 39.37 mL/min/1.73 m^2; hemoglobin, 13.0 g/dL; PSA, under 0.008 ng/mL. His urine test was as follows: red blood cells, 20–29/hpf; white blood cells, 5–9/hpf. After receiving two courses of gemcitabine plus carboplatin (AUC 4), his plain CT and plain MRI detected no metastasis. He desired RARC for radical treatment.

Surgical technique: Under general anesthesia, the patient was placed in a low lithotomy position with a 25-degree head-down tilt (Fig. 1a). He underwent RARC using the da Vinci Xi System® (Intuitive Surgical, USA) with a fingertip type of TRUS probe (EUP-F334®, FUJIFILM Healthcare Corporation, Japan) to guide a rectovesical space (Fig. 1a,b). An assistant can manually rotate the fingertip TRUS probe under the clean or unclean field to delineate the pelvic floor and robotic forceps. Port position is described in Fig. 1c. Adhesion of the paravesical cavity was mild, allowing us to dissect the cavity more easily than expected. Adhesion between the lavetor ani muscle and the bladder was moderate (Fig. 2a). However, it was extremely difficult to see the dissection line, especially around the vesicourethral anastomotic site, due to strong adhesion of the rectovesical space (Fig. 2b). We used real-time TRUS guidance and athermally dissected scar tissue. We also injected saline into the bladder, which made it easier to visualize the border of the bladder and rectum (Fig. 2c,d). As strong adhesion prevented blunt dissection around the vesicourethral anastomotic site, we dissected the rectovesical space through athermal cold incision (Fig. 2e,f). The surgery was completed without any complications including rectal injury. Surgical video is provided as the Supplemental file.

The operation time was 498 min and the robot console time was 307 min. Estimated blood loss was 50 mL. There were no perioperative adverse events. He was discharged from our hospital on postoperative day 17. He was readmitted to hospital on postoperative day 36 for an adhesive small bowel obstruction. Conservative management relieved the obstruction. The histopathological finding was ypT0, ypN0 (0/19), and negative resection margin. He had no recurrence of urothelial carcinoma 16 months after the surgery.

Discussion

RC in patients who have had both RP and EBRT is extremely difficult and technically challenging. After RP, surgical milestone including seminal vesicles and vas deferens were removed. In addition, salvage EBRT or adjuvant EBRT after RP would be expected to have a further negative impact on the surgical field such as adhesion of the rectovesical space, leading to increase the risk of rectal injury.

Kim and Steinberg reported that ORC with prior pelvic radiation therapy (18 men and 5 women) had significant higher rate of surgical complications than that without prior pelvic radiation therapy (men 16 and women 7) (p = 0.045).[4] In contrast, Al Hussein Al Awamlh *et al*. reported that there was no significant difference with complications between RARC with or without prior pelvic radiation therapy.[5] Understanding of the anatomy of the dissected surface in the rectovesical space, standardization of surgery, and clearer

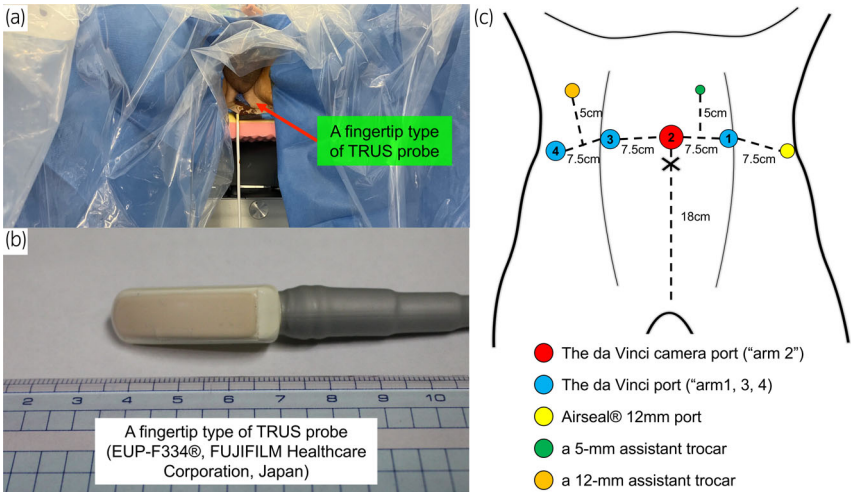

Fig. 1 (a) The patient's body position. The patient was placed in a low lithotomy position with a 25-degree head-down tilt. A fingertip type probe was inserted transrectally. (b) A picture of the fingertip type of TRUS probe. (c) The scheme of the port position. Using the Open Hasson technique, the da Vinci camera port (“Arm 2”) was placed 18 cm above the suprapubic border in the midline through a 3-cm transverse incision. The da Vinci port for “Arm 1” and “Arm 3” were placed symmetrically on the left and right side, 7.5 cm away from the camera port, at the same transverse level as the camera port. The da Vinci port for extra arm (“Arm 4”) was placed on the right side, 7.5 cm away from the “Arm 3” port, 2 cm above the right anterior superior iliac spine. Two assistant ports were placed on the left side of the patient: a 5-mm trocar at 5 cm above the midpoint of the camera port and the da Vinci “Arm 1” port, and a 12-mm trocar (Airseal®, CONMED, the United States) on the left side, 7.5 cm away from the “Arm 1” port, 2 cm above the left anterior superior iliac spine. A 12-mm assistant's trocar was placed on the right side of the patient, at 5 cm above the center of the da Vinci “Arm 3” and extra arm. The red circle represents camera port. The blue circles represent the da Vinci port (8 mm). The yellow circles represent assistant ports.

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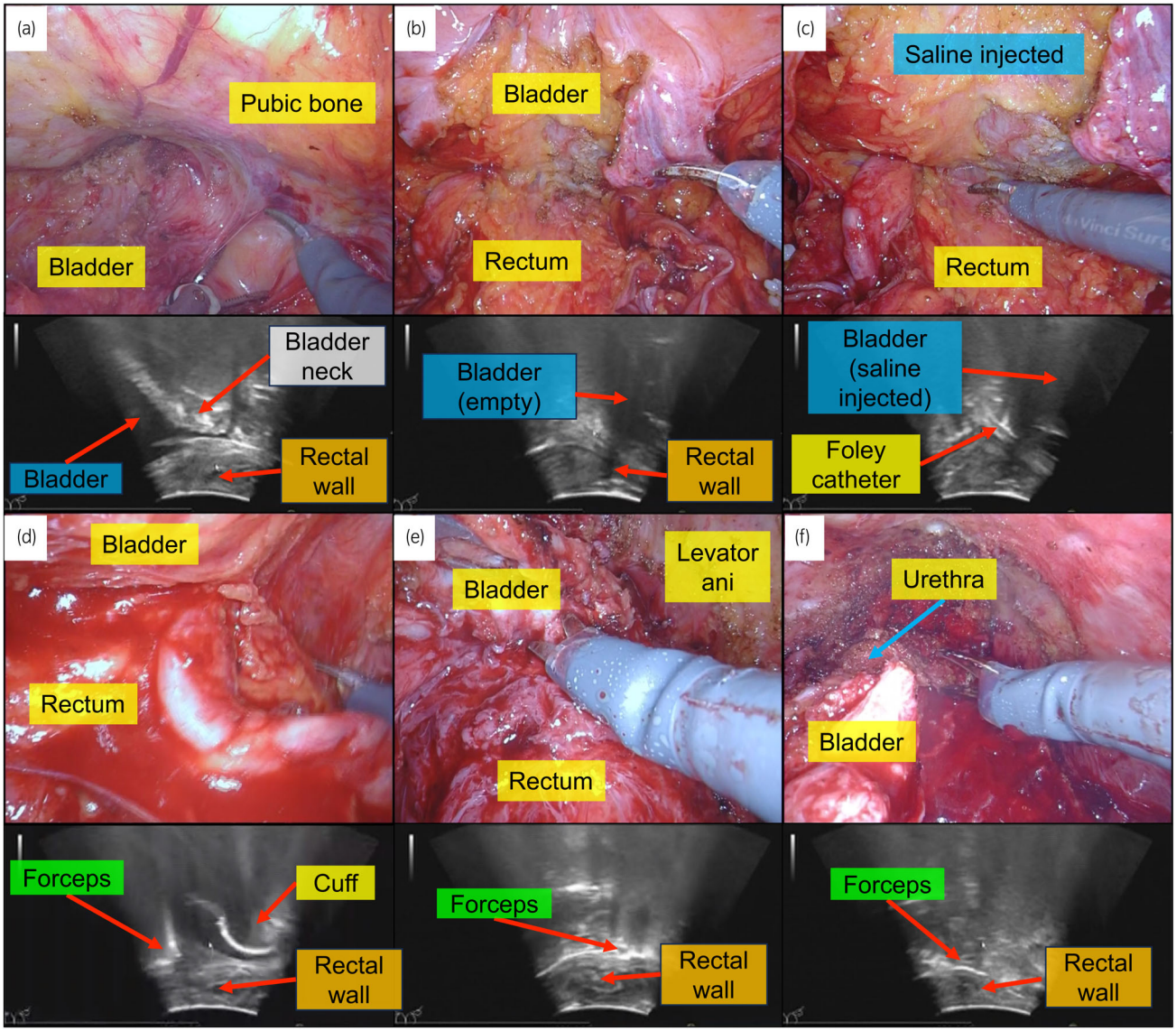

Fig. 2 Intraoperative images. The upper images show the endoscopic images and the lower images show the TRUS image displayed on the TILEPRO®. By checking the TRUS image displayed on the TILEPRO® when the scissors have been tapped, the boundaries between the rectal wall and the bladder can be visualized. (a) The dissection between the lavetor ani muscle and the bladder. (b) The dissection of the rectovesical space before saline injection into the bladder. (c, d) The dissection of the rectovesical space after saline injection into the bladder. (e, f) The dissection around the vesicourethral anastomotic site.

visualization with robotic surgery may have reduced the risk and incidence of rectal injury.

Conversely, RC after RP seems to increase the likelihood of rectal injury. Rosiello *et al*. reported that RARC with previous prostate surgery had significantly higher rates of intraoperative complications compared to that without previous prostate surgery (19% vs 6.8%).[6] Tappero *et al*. reported 140 cases of RC after RP. Of these, 69 were after salvage or adjuvant radiation therapy. Of the 140 cases, 134 were ORC and only 6 were RARC. In multivariate logistic and Poisson regression models, radiation therapy after RP for PC was the independent risk factor for postoperative complications in RC.[7]

These results suggest that the risk of rectal injury in RC does not increase with prior radiation therapy alone, but it does increase when to have prior RP. It is possible that EBRT to the prostate bed following to RP further increases the likelihood of rectal injury due to adhesion of the rectovesical space in addition to the lack of anatomical milestone.

To minimize the risk of rectal injury, we have devised the following three measures. First, we used real-time TRUS guidance to visualize the plane of dissection on the rectovesical and rectoprostatic space. Intraoperative TRUS guidance is reported to clarify the rectoprostatic space[8–10] and may prevent rectal injury in RARP.[11] TRUS image can confirm where forceps have been tapped, allowing the location of the anatomical structures to be determined in relation to the area that is now being dissected. We routinely use a fingertip probe for RARP. A fingertip probe is small and does not alter the shape of the rectum, which is expected to be less harmful

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to the rectum and easier to handle than a standard biplane TRUS. To our knowledge, this is the first report of RARC with the use of intraoperative TRUS guidance. It is not necessary to use TRUS in all RARC cases, but in cases where dissection of the rectovesical space is expected to be difficult, such as after prostatectomy or EBRT, the use of a fingertip probe could be recommended. Second, saline was injected into the bladder as needed to visualize the boundary of the rectovesical space with TRUS. Third, since adhesion was particularly severe near the vesicourethral anastomosis, athermal incision and dissection were employed to avoid thermal injury. These ingenuities might allow us to perform RARC without rectal injury in the high-risk post-prostatectomy, post-EBRT patients.

Author contributions

Yuta Inoue: Conceptualization; data curation; formal analysis; investigation; methodology; writing – original draft. Takeshi Yamada: Conceptualization; writing – original draft; writing – review and editing. Yuji Okusa: Data curation; writing – review and editing. Hideto Taga: Data curation; writing – review and editing. Takashi Ueda: Formal analysis; writing – review and editing. Takumi Shiraishi: Formal analysis; writing – review and editing. Atsuko Fujihara: Data curation; writing – review and editing. Masayoshi Okumi: Formal analysis; writing – review and editing. Fumiya Hongo: Supervision; writing – review and editing. Osamu Ukimura: Conceptualization; formal analysis; supervision; writing – review and editing.

Conflict of interest

Osamu Ukimura is the editor-in-chief of International Journal of Urology and a co-author of this article. Fumiya Hongo is an editorial board member of International Journal of Urology and a co-author of this article. To minimize bias, they were excluded from all editorial decision-making related to the acceptance of this article for publication.

Approval of the research protocol by an Institutional Reviewer Board

This report has been approved by the Research Ethics Committee of Kyoto Prefectural University of Medicine (ERB-C-1180-2).

Informed consent

Not applicable.

Registry and the Registration No. of the study/trial

Not applicable.

References

1 Kader AK, Richards KA, Krane LS, Pettus JA, Smith JJ, Hemal AK. Robot-assisted laparoscopic vs open radical cystectomy: comparison of complications and perioperative oncological outcomes in 200 patients. *BJU Int.* 2013; **112**: E290–4.

2 Bachman AG, Parker AA, Shaw MD *et al*. Minimally invasive versus open approach for cystectomy: trends in the utilization and demographic or clinical predictors using the National Cancer Database. *Urology* 2017; **103**: 99–105.

3 Parekh DJ, Reis IM, Castle EP *et al*. Robot-assisted radical cystectomy versus open radical cystectomy in patients with bladder cancer (RAZOR): an open-label, randomised, phase 3, non-inferiority trial. *Lancet* 2018; **391**: 2525–36.

4 Kim HL, Steinberg GD. Complications of cystectomy in patients with a history of pelvic radiation. *Urology* 2001; **58**: 557–60.

5 Al Hussein Al Awamlh B, Nguyen DP, Otto B *et al*. The safety of robot-assisted cystectomy in patients with previous history of pelvic irradiation. *BJU Int.* 2016; **118**: 437–43.

6 Rosiello G, Piazza P, Tames V *et al*. The impact of previous prostate surgery on surgical outcomes for patients treated with robot-assisted radical cystectomy for bladder cancer. *Eur. Urol.* 2021; **80**: 358–65.

7 Tappero S, Chierigo F, Parodi S *et al*. Radical cystectomy in bladder cancer patients previously treated for prostate cancer: insights from a large European multicentric series. *Surg. Oncol.* 2023; **50**: 101973.

8 Ukimura O, Gill IS, Desai MM *et al*. Real-time transrectal ultrasonography during laparoscopic radical prostatectomy. *J. Urol.* 2004; **172**: 112–8.

9 Ukimura O, Magi-Galluzzi C, Gill IS. Real-time transrectal ultrasound guidance during laparoscopic radical prostatectomy: impact on surgical margins. *J. Urol.* 2006; **175**: 1304–10.

10 Hung AJ, Abreu AL, Shoji S *et al*. Robotic transrectal ultrasonography during robot-assisted radical prostatectomy. *Eur. Urol.* 2012; **62**: 341–8.

11 Mohareri O, Ischia J, Black PC *et al*. Intraoperative registered transrectal ultrasound guidance for robot-assisted laparoscopic radical prostatectomy. *J. Urol.* 2015; **193**: 302–12.

Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Video S1.

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