

CASE REPORT

Extraperitoneal Laparoscopic Radical Prostatectomy with Handheld Articulating Laparoscopic Instruments Driven by Robotic Technology

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Abstract

Robotic-assisted radical prostatectomy (RARP) is a popular current minimally invasive surgical treatment option for organ-confined prostate cancer (PCa). The benefits of RARP concerning fully articulating robotic arms and three-dimension (3D) vision are widely accepted. However, the cost of the RARP is the main limitation. Laparoscopic radical prostatectomy (LRP) has been still in usage for its minimally invasive features, but it is a very complex procedure, has negative effects on surgeons' ergonomics, and has a limited vision on 2D. At his point, LRP with articulating devices and 3D vision is logical. We here reported an extraperitoneal LRP case with articulating laparoscopic instruments (Kymerax®, Terumo, Hatagaya, Tokyo, Japan) with the 3D visualizing system (Viking Systems, La Jolla; CA). To our knowledge, this is the first extraperitoneal LRP using this set, in the literature.

Keywords: Laparoscopy; prostate cancer; robotics; surgical equipment.

Radical prostatectomy (RP) is the backbone of the surgical treatment for organ-confined prostate cancer (PCa) [1]. The fascinating development in endourology provided improvements in minimally invasive surgical modalities. Laparoscopic and robotic RP are the standard of care in advanced clinics worldwide. The very well-known advantages of robotic-assisted radical prostatectomy (RARP) concerning fully articulating devices, three-dimension (3D) optical magnification, and being less invasive have been published [2]. However, the cost of RARP is still a major problem. On the other hand, laparoscopic radical prostatectomy (LRP) stands out with the reduced cost, but a long learning curve, limited ergonomics, being the complexity of the procedure, with two-dimensional (2D) optic system are the essential problems in LRP [3]. In view of them, LRP with articulating devices and the 3D visualizing system is

logical and maybe an alternative to RARP for overcoming problems in LRP. We here reported an extraperitoneal LRP case with articulating laparoscopic instruments (Kymerax®, Terumo, Hatagaya, Tokyo, Japan) with 3D visualizing system (Viking Systems, La Jolla; CA). To our knowledge, this is the first case of LRP with this set.

Case Report

A 51-years-old man admitted with lower urinary tract symptoms to urology outpatient clinic. After detailed physical and laboratory examinations, the prostate-specific antigen was 8 ng/dl. Then, ultrasound-guided prostate biopsy (prostate volume was 70cc in ultrasound) was performed in 12 cores, and pathology reported PCa with Gleason score 3+3=6 in 2 cores from the left side of prostate. The patient had no previous medical and/or history. The patient was

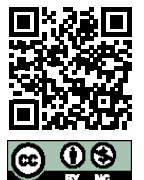
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diagnosed as cT1c PCa and underwent extraperitoneal LRP with the operation set mentioned above after signing the informed consent form.

Surgical Technique

The patient was taken to Trendelenburg position with 10-20 degrees under general anesthesia. The extraperitoneal approach was used, and the traditional trocar placement was applied [2]. Then, retzius was dissected with articulating instruments (Kymerax, Terumo, Japan) (Fig. 1a, b) under 3D HD Visualization System (Viking Systems, La Jolla; CA, USA). The bladder neck was dissected in a manner of bladder neck sparing surgical technique (Fig. 2a) [4]. Then, periprostatic fascia was dissected using the bilateral nerve-sparing technique (Fig. 2b). Bilateral vas deferentia was transected and then the dorsal venous complex was sutured and cut. At the end of this procedure, urethra was dissected and cut (Fig. 2c). A new urethral catheter was inserted and urethrovesical anastomosis was completed using V-Loc™ 180 absorbable Wound Closure Device (Covidien, Minneapolis, MN) (Fig. 2d). The watertight of the anastomosis

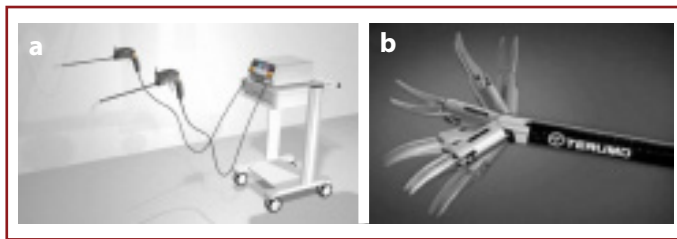


Figure 1. (a, b) The Kymerax system. **(a)** The KYMERAX System is comprised of a console, handles, and interchangeable instruments. **(b)** The articulation and rotation features of the instrument's tip.

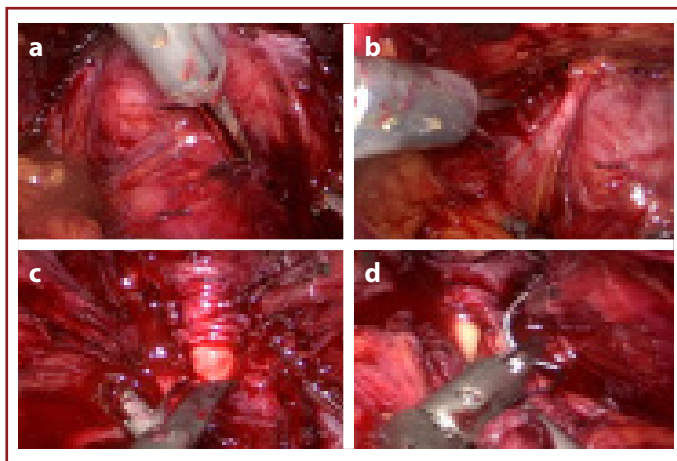


Figure 2. (a-d) Extraperitoneal laparoscopic radical prostatectomy was successfully performed with Kymerax articulating devices under three-dimension vision. **(a)** Dissection of bladder Neck, **(b)** Opening endopelvic fascia, **(c)** Dissection of prostate's apex and cutting urethra, **(d)** Urethrovesical anastomosis.

was checked by filling 150 ml saline. The rectum was also checked by blowing 50 cc air from the rectal catheter for injuries. Finally, the operation specimen was taken into endobag™ (Covidien, Minneapolis, MN) and a drainage catheter was inserted in the operation field. Neither preoperative and perioperative nor postoperative complication occurred. The estimated blood loss was 50 cc and operation time was 130 min. The drainage tube was removed on the 2nd day and the urethral catheter was removed 7th day of surgery. Patient's consent was obtained for this study.

Discussion

The long learning curve, traditional non-articulating devices, 2D visualizing system, and also, the complexity of the RP procedure are the overriding difficulties in LRP. The RARP, of course, can overcome them. However, the cost of the procedure is the main limitation for the RARP. Thus, LRP with the 3D visualizing system with articulating devices is reasonable. However, to our knowledge, there is no published report on LRP with this set. Kymerax (Kymerax, Terumo, Japan) has been recently introduced in our community. Its system consisted of a console, handles, and interchangeable instruments. Up to two handles can be connected to the console, which provides power to the motors located within the handle component of the system. These motors are activated by the user through the manipulation of the buttons and controls of the handle interface and allows for rotation and yawing motions of the instruments' tips. The motors for the instruments rotation and yawing speed can be adjusted from 1 to 5 (slow to fast) within the console. The four available instruments attach to the handle component, are 8.8 mm in diameter and include Monopolar scissors, Maryland dissector, needle driver, and monopolar L-hook. These articulating facilities of Kymerax provided us to dissect and cut tissues easier than traditional laparoscopic devices. Hackethal et al. [5] reported a similar operation set in laparoscopic hysterectomy. Furthermore, they stated that the Kymerax system is more ergonomic than the traditional laparoscopic set with traditional devices. However, to our knowledge, this is the first case of extraperitoneal LRP with Kymerax. We experienced parallel findings to them. In addition, LRP is one of the most difficult surgical modality in urologic laparoscopic procedures. This report can be proof of Kymerax's usefulness in difficult urological surgical modalities. We know that the Kymerax system with two articulating laparoscopic devices cannot take the place of four armed robots. However, it can be just an alternative and this system is seemed more comfortable than traditional laparoscopic devices. We are sure that additional studies should be conducted to compare

ergonomics of Kymerax with traditional devices in laparoscopic procedures in future studies. On the other hand, we should note that we previously reported the benefits of the 3D visualizing system in LRP [6]. In the present report, we used the same 3D setting with Kymerax. This operation set can provide surgeons more anatomical details. Additionally, to perform suture was easier than a traditional operation set with 2D. We could experience this notably during urethra-vesical anastomosis. Hruby et al.[7] reported that the Kymerax system showed remarkable advantages over standard instruments in standard dry lab settings and could be adapted quickly and easily. In the present case, our surgeon (S.A.) and assistants easily adapted Kymerax system; however, our surgeon has been experienced with Kymerax in other urologic laparoscopic procedures.

Conclusion

To our knowledge, this is the first extraperitoneal LRP case with Kymerax using 3D visualizing system. According to our initial experience, this operation set is very useful and can be easily adapted. Thus, usefulness and easy adaptation to Kymerax in laparoscopic urologic difficult procedures can be feasible. However, more studies are needed on this issue.

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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