A Laparoscopic Radical Prostatectomy Assisted by the "ZEUS" Robotic System: An Initial Case Report

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A Laparoscopic Radical Prostatectomy Assisted by
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Abstract A 68-year-old man with prostate cancer, T1cN0M0, was treated with laparoscopic radical prostatectomy (LRP) assisted by the ZEUS robotic system. The ZEUS system was utilized only for vesico-urethral anastomosis, one of the most difficult procedures to perform during LRP. We could complete the vesico-urethral anastomosis using the ZEUS system for 100 min without any intraoperative complications. The urethral catheter was removed 7 days after operation. To our knowledge, this is the initial case of robot-assisted radical prostatectomy using the ZEUS system.

Key words: robotic surgery, laparoscopy, radical prostatectomy, ZEUS

INTRODUCTION

After Walsh and Donker introduced the anatomical technique for a nerve sparing radical prostatectomy in 1982, surgery became an effective and acceptable treatment for localized prostate cancer, especially in young patients. In the late 1990s, a laparoscopic approach was introduced for a radical prostatectomy at several institutions. Among them, Guillonneau et al recently reported a laparoscopic radical prostatectomy (LRP) to provide satisfactory results regarding local tumor control and biochemical recurrence in their follow-up of 1000 cases. In addition, Tewari and Menon recently reported excellent results for 250 cases of a robot-assisted radical prostatectomy using the “da Vinci” system (Intuitive Surgical, Mountain View, CA). However, there has so far been no report on a robot-assisted radical prostatectomy using the “ZEUS” system (Computer Motion, Goleta, CA). The ZEUS system consists of two physically separated subsystems named “surgeon-side” (Fig. 1a) and “patient-side” (Fig. 1b). The surgeon’s subsystem has a console that takes the surgeon’s input (Fig. 1a), whereas the patient’s subsystem includes two robotic arms that translate the input into actual instrument manipulation and an additional robotic arm for AESOP, an automated endoscope system for optimal positioning, that can be controlled by voice command (Fig. 1b). The most recent version of ZEUS uses ergonomic handles called microwrist (Fig. 1c), and a Storz three-dimensional (3D) imaging system (Fig. 1d). We herein report a case...
of LRP which was performed using the ZEUS robotic system.

CASE REPORT

A 68-year-old man presented with an elevated prostate specific antigen (PSA) level. Although he had no signs of prostate cancer based on a digital rectal examination or transrectal ultrasonography, a transperineal twelve sextant biopsy of the prostate showed moderately differentiated adenocarcinoma, with a Gleason score 4+3=7, from the left peripheral zone. The clinical stage was T1cN0M0, and a LRP using the ZEUS robotic system was performed on June 20, 2003. The LRP was basically done using the modified operative techniques of the French groups\(^2\). The ZEUS system was utilized to perform vesico-urethral anastomosis, one of the most difficult procedures to perform during LRP (Fig. 2a)\(^4\). Two (right and left) arms and the AESOP (an endoscope positioner) arm of the ZEUS system were placed as shown in Fig. 3. It took 20 minutes to set up the ZEUS system. In our first case using the ZEUS system, the total operative time was 450 min and blood loss was 500 ml. Vesico-urethral anastomosis using the ZEUS system (Fig. 2b) required 100 min. The postoperative course was uneventful and the patient started oral intake on the next day after operation. The urethral catheter was removed 7 days after operation. The pathology of the resected specimen was pT2bN0. Eleven months after the surgery, he is now using no pads for urinary incontinence.

DISCUSSION

Recently, LRP was developed by the French Groups\(^2\). Their data regarding cancer control, postoperative urinary and sexual function are satisfactory, and Guillonneau et al. indicated that LRP can also be used as
LRP, laparoscopic radical prostatectomy

Fig. 2 Vesico-urethral anastomosis performed by the ZEUS system. (a) a schema of vesico-urethral anastomosis (cited from ref. 4), (b) an actual laparoscopic view with the ZEUS system. The most characteristic feature of the ZEUS system is the wrist function of forceps that makes ties of sutures easier.

is vesico-urethral anastomosis, which requires sutures to be tied in the narrow pelvis. As a result, we utilized the ZEUS robotic system for such anastomosis, because the two arms of the ZEUS system

Fig. 3 The trocars and robot position. The trocars used are as follows: (⊙) a 12 mm trocar for the AESOP (an endoscope positioner) arm of the ZEUS system, (●) 5 mm trocars for the right and left arms of the ZEUS system, (○) 5 and 12 mm trocars for the assistants. Three thick arrows show the direction of the right arm, left arm, and AESOP, respectively.
have a wrist function which makes the tying of such sutures easier than by hand (Fig. 2b). However, vesico-urethral anastomosis using the ZEUS system took 100 min to perform, which was not shorter than our average anastomosis time without ZEUS (data not shown). Since this is our first case with ZEUS, we believe that we can shorten the operation time as we increase our experience using the ZEUS system. In addition, although anastomotic leakage is one of the postoperative complications after LRP (12% of the postoperative complications in our institute, data not shown), ZEUS-assisted anastomosis may be able to reduce the incidence of leakage.

Up to now, two robotic systems, namely the da Vinci and ZEUS systems, have been utilized for clinical operations. Each system has its own merits and faults. Briefly, although the da Vinci system is larger and requires a longer time for setting up than ZEUS, da Vinci seems to provide smoother movements of the forceps and a better three dimensional view than ZEUS. Tewari and Menon recently reported excellent results for 250 cases undergoing a robot-assisted radical prostatectomy using the da Vinci system. Thus, the robot-assisted radical prostatectomy using the da Vinci is now spreading. In our case, we utilized the ZEUS system only for vesico-urethral anastomosis, whereas Tewari and Menon used the da Vinci system for all LRP procedures. We therefore can not directly compare the two results. However, one of the disadvantages in the current robotic systems is lack of an effective force-feedback feature. The lack of tactile feedback can sometimes cause inadvertent tissue damage. That is one of the reasons why we used the ZEUS system only for vesico-urethral anastomosis. In addition, the conversion to the ZEUS system from conventional laparoscopic surgery is relatively easier than that to the da Vinci system, because we can use the same trocars as the conventional laparoscopic surgery in the ZEUS system. Taken together, the utilization of the ZEUS system only for vesico-urethral anastomosis in LRP may become an alternative method to optimize the merit of the ZEUS system. After performing more LRP cases using the ZEUS system, we will thus be able to better answer the question regarding "which robotic system is most suitable for LRP?"

REFERENCES


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手術支援ロボットゼウスを用いた
腹腔鏡下根治的前立腺摘除術の一例

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前立腺癌で臨床病期 T1cN0M0 の 68 歳男性患者に対して手術支援ロボットゼウスを用いた腹腔鏡下根治的前立腺摘除術を施行した。我々は腹腔鏡下根治的前立腺摘除術の最も困難な手技の一つである膀胱尿道吻合に対してのみゼウスシステムを用いた。ゼウスを用いた膀胱尿道吻合には 100 分を要したが、術中合併症は認められなかった。尿道留置カテーテルは術後 7 日目に抜去することができた。我々が調べ得た限りで、本症例は手術支援ロボットゼウスを用いた腹腔鏡下根治的前立腺摘除術の最初の報告である。