

A Unique Instrumental Malfunction during Robotic Prostatectomy

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Over the past decade, the introduction of robotics in the field of medicine has provided a new approach to patients requiring surgery, and both its advantages and disadvantages are currently under study by many groups worldwide. The use of robotics has especially been considered by the urological community as a treatment option in radical prostatectomy. The current case report is one in which the da Vinci Surgical System™, with fourth arm use was employed in radical prostatectomy. This case presents a unique occurrence in which a bolt of the Prograsper forcep became loose during an operation, leading to diminished device functionality and later impedance of its removal. A circumstance such as this has not previously been reported, so we introduce for other robotic surgeons our unique instrumental malfunction case during a robotic prostatectomy.

Key Words: Prostatectomy, robotics, malfunction

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INTRODUCTION

In recent years, the development of robotics for their application in the medical field has presented to surgeons an additional option in treating their patients. Robotic systems such as the da Vinci Surgical System™ have been introduced to the medical community and many centers worldwide have begun to include the use of these technologies in the treatment of patients. In the field of urology, robotics is currently being employed in addition to conventional open surgery. Robotic-assisted laparoscopic radical prostatectomy (RLRP) for the treatment of organ-confined prostate cancer is one such example.¹ RLRP has had a wide diffusion in the last 5 years. In recent reports, RLRP has a short learning curve and better postoperative and functional outcomes.^{2,3} With several groups conducting robotic surgeries in urology, it is expected that the utility of robotic surgery will be thoroughly evaluated and will aid in the further development of robotic systems for use in the healthcare sector. Zorn, et al.⁴ reported that the device failure rate of da Vinci Surgical System™ was 0.5%, and there were subsequently no instrumental malfunctions. Thus, device failure leading to case conversion or abortion may be higher during a surgeon's initial RLRP experience. We introduce for other robotic surgeons our unique case during which a bolt of the Prograsper forcep became loose during a robotic prostatectomy.

CASE REPORT

A 56-year-old Korean male presented with prostate adenocarcinoma. The

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patient's prostate size, measured using ultrasonography, was 30.7 cc, and his preoperative PSA was 8.88 ng/mL. With a clinical stage of T2c and a preoperative Gleason score of 7 (3+4), the patient underwent RLRP. We have used the transperitoneal approach and the fourth arm during RLRP for over 150 cases. However, during this particular surgical procedure, we experienced a malfunction of the fourth arm instrument. We used the Prograsper forcep as our fourth arm instrument. Forcep function was initially unaffected; however, as the procedure progressed, the joint bolt began to slide-out farther, and forcep function was slightly decreased, limiting the use of the fourth arm. The surgeon did not initially experience notable difficulties. Following surgery, during the extraoperative period, the limit in forcep function was explored. As the forcep itself could not be removed, the trocar with the instrument was removed in whole unit form, leading to the discovery of the loosened bolt which had impeded the removal of the forcep (Fig. 1). The second assistant used a conventional laparoscopic device for countertraction and grasping a. The operation was finished successfully. This instrument had been used previously in the RLRP of three other conventional cases. Fortunately, this instrumental error did not result in any problem during RLRP. The entire operative time was 225 min and estimated blood loss was 300 mL. Overall, the surgery was successful with no other intraoperative or perioperative complications, and the postoperative hospital recovery course was normal.

DISCUSSION

RLRP is a new treatment option in the field of urology and is playing an increasing role in the surgical management of prostate cancer. Many surgeons use the fourth arm during RLRP. The fourth arm is useful as it can apply countertraction. The presence of a fourth arm also makes solo-surgery

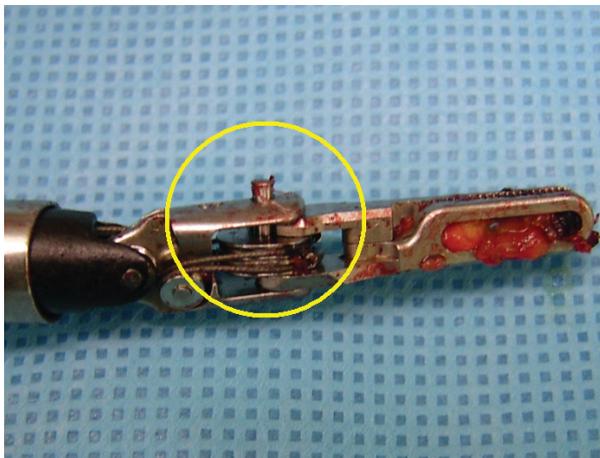


Fig. 1. Prograsp Forcep with loosened bolt (encircled).

possible by taking the place of the patient-side surgeon.^{5,6} The most important issue to consider through our case is that although the use of robotics in surgery has many advantages, because robots are mechanical devices, it is imperative that their mechanical function be checked before surgery. In this way, mechanical malfunctions, such as that presented in this case report, are less likely to occur. Borden, et al.⁷ described that although uncommon, malfunction of the da Vinci Surgical System™ does occur and may lead to psychological, financial, and logistical burdens for patients, physicians, and hospitals. In their review, 9 of the 350 (2.6%) scheduled RLRP were unable to be completed robotically due to device malfunction. Three malfunctions occurred intraoperatively and were converted either to a conventional laparoscopic or an open surgical approach. However, in six of the nine cases they detected the mechanical malfunction of the robotics prior to surgery, and as a result were able to avoid conversion to open or laparoscopic prostatectomy. The etiology of the malfunctions included the following: set-up joint malfunction (n = 2), arm malfunction (n = 2), power error (n = 1), monocular monitor loss (n = 1), camera malfunction (n = 1), metal fatigue/break of surgeon's console hand piece (n = 1), and software incompatibility (n = 1). Zorn, et al.⁴ reported that the device failure rate of da Vinci Surgical System™ was 0.5%, and there were no intraoperative instrumental failures that resulted in a case conversion in the single institution experience with a three-arm robot unit of more than 700 consecutive RLRP. The errors consisted of a power error (n = 1) and optical malfunction (n = 3). In the recent review on device failures associated with patient injuries during robot-assisted laparoscopic surgeries,⁸ of the 189 reported device malfunctions, only 9 (4.8%) were associated with patient injury. They pointed that the rate of open conversions due to device malfunction decreased with experience, and only a small percentage of these adverse occurrences were associated with patient injury. In our case, the surgical procedure was not negatively affected by the decrease in function of the Prograsper forcep, and fortunately we could finish the operation without converting to either a conventional laparoscopic or an open surgical approach. However, surgeons should be aware of the possibility of such mechanical problems and should note that the patient can be put under great potential danger when such instrument malfunction occurs. Most of these malfunctions can be detected prior to anesthesia induction and if detected earlier, these malfunctions also can be avoided without much difficulty. Therefore, the specific goal of our case report is to increase surgeons' awareness about potential mechanical malfunctioning during robotics-assisted operations and hope that our case will contribute to the well-informed use and further development of robotics in surgery.

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