



## Side Docking vs. Central Docking in Robotic Assisted Laparoscopic Prostatectomy with daVinci Si: a Randomized Study

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### Abstract

**Introduction:** Robot-assisted radical prostatectomy is performed routinely with central docking. This positioning can be associated with perineal nerve injury and compartment syndromes in rare cases. Moreover, the low lithotomy may not be feasible in patients with a history of bilateral hip arthroplasty which typically limits abduction position. In this study we investigate the feasibility and safety of side-docking techniques in robot-assisted urologic pelvic surgery.

**Method:** 192 consecutive patients from March 2013 to September 2016 undergoing robot-assisted radical prostatectomy participated in the study and randomized in two, groups: Group a (n 96) with side docking and Group B (n 96) central docking. Each patient was placed in the lithotomy-Trendelenburg position. The result was compared in terms of docking time, operative time, and complication rate.

**Results:** All the procedures were completed without the need for redocking. No significant collision between the robotic arms occurred. There was no Clavien-Dindo III-V complication in any case. Mean docking time was 5.7 min Group A and 6.2 min Group B Mean operative times was 123 minutes for group A and 125 for group B. All the procedures were completed without the need for redocking. No significant robot arm collision occurred. The mean hospital stay was 4 days (range 3-9 days). There was no Clavien-Dindo grade III-V complication in our series.

**Discussion and Conclusion:** Side docking for robotic radical prostatectomy is a viable alternative positioning technique for patients with hip abduction limitations to the standard low lithotomy positioning. Major alterations with the surgical technique are not required, and the perioperative outcomes are comparable to outcomes with the standard low lithotomy positioning.

### Introduction

Robotic-assisted laparoscopic radical prostatectomy (RALP) has dramatically altered the surgical treatment of localized prostate cancer and urological surgery in general. The standard low lithotomy position described since the introduction of robot-assisted laparoscopic radical prostatectomy (RARP) technique may expose the patient to neurapraxia phenomena of the lower limbs and can hardly be used in patients with problems of hip abduction. Moreover, prolonged patient positioning on stirrups together with steep Trendelenburg and pneumoperitoneum increases the risk of compartment syndromes. Lacking a consistent literature on different approaches to overcome these limitations, we sought to evaluate the clinical benefits of "side docking" (SD) of the daVinci robotic system compared to "traditional docking" (TD). A significant limitation of the conventional docking method is restricted access to the perineum and urethra. Rectal palpation and the insertion of a proctoscope might be helpful for detecting rectal injury during surgery. This positioning can be associated with perineal nerve injury and compartment syndromes in rare cases. Moreover, the low lithotomy may not be feasible in patients with a history of bilateral hip arthroplasty which typically limits abduction position. We report our experiences with side docking in robot-assisted radical prostatectomy.

### Patients and Methods

After training when all the dedicated staff became expert in the docking procedure it was decided to undertake this study.

Between March 2013 and September 2016, 192 consecutive patients with clinically localized

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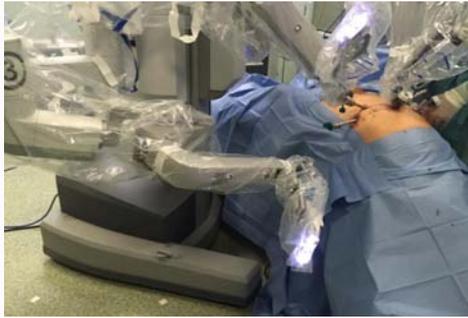
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**Figure 1:** The robot was docked to the left side of the patient near the left anterior superior iliac spine at an angle nearly parallel to the lower torso.



**Figure 2:** Finally, another 8 mm left sided robotic working port in a position which is an exact mirror image to the 8 mm left-sided robotic port.

prostate cancer underwent RALP at our institution. The data include patient demographics, indications for robotic prostatectomy, operating room setup start times, surgical times, console times, estimated blood loss, and perioperative complications. Setup time is defined as the time interval from patient entry to the operating room to the surgical start time, and the docking time is the time interval from port placements to docking of the robot.

This patients was randomized in two group, Group 1 consisted of 96 patients who had standard low lithotomy positioning with the robot placed between the legs, and group 2 consisted of the other 39 patients in the supine position with the robot side-docked. The Student t test was used to compare both groups. The 4-arm da Vinci Si robotic system (Intuitive Surgical, Sunnyvale, CA) was used in all cases. Insufflation and port placement were performed using the standard method. The CO<sub>2</sub> abdominal pressure was controlled by air seal system.

### Side-Docking Techniques

All the patients were placed in a steep Trendelenburg in the low lithotomy position. The operating table was placed in the Trendelenburg position at approximately 35° to allow the bowel to fall back from the pelvic cavity. The robot was docked to the left side of the patient near the left anterior superior iliac spine at an angle nearly parallel to the lower torso (Figure 1). The key principles of set up include: Bring the side cart in at 45 degree angle to the axis of the patient on the operating room table. There are no sweet spots

**Table 1:** Patient characteristics.

	CENTRAL DOC. GR.	SIDE DOC. GR.	p
PSA	7.9	7.85	>0.05
AGE	62.1	61.5	>0.05
B.M.I	26.58	27	>0.05
BIOPSY GLEASON S.	6.5	6.5	>0.05
PROSTATE VOLUME (c.c.)	56.75	54.16	>0.05

**Table 2:** Operative times.

	CENTRAL DOC Gr	SIDE DOC. Gr	p
SET UP TIME (min)	42	37	>0.05
DOCKING TIME (min)	5.36	5.46	>0.05
SURGERY TIME (min)	123	125	>0.05
MEAN EBL (mL)	255	283	>0.05
HOSPITAL STAY (Day)	4,4	4,7	>0.05

when side docking. Orient the column in line to the contralateral shoulder prior to docking the robot, the patients is placed in a steep Trendelenburg >30° and the bed is lowered. The arms are then docked. Arm one (Camera) is docked first. The other arm is oriented laterally, and then the arm 2-3-4 is docked next. Port placement was the same as in central docking. The Camera port is inserted 1 cm above the umbilicus. The 8 mm robotic arm port is then placed approximately 8 cm away from the midline camera port slightly below the umbilicus and lateral to the edge of the rectus muscle. For the second assistant suction port (5 mm), an imaginary line is drawn connecting the right sided 8 mm robotic port and the midline camera port and, at the midline of this line the port is inserted under visualization. On the right side of the patient, an 8 mm fourth robotic arm port is placed using the same landmarks as the 12 mm left- sided lateral assistant port. Finally, another 8 mm left sided robotic working port in a position which is an exact mirror image to the 8 mm left-sided robotic port (Figure 2).

The arms of the robot were docked to the ports, from right to left, after which the amount of space was checked to make sure there was adequate room for movement without collision or limitations. The assistants then stood to the right of the patient and between the patients's. RALP is performed as described by the Montsouris technique and a bilateral pelvic lymphadenectomy is performed after the completion of radical prostatectomy only in patients with biopsy's gleason score from 7 (3+4).

### Results

Patient age and BMI for the 2 groups are depicted in Table 1. There are no statistical difference in two groups in all parameters, such as age, PSA, tumor characteristics, prostate volume and BMI. Setup time was similar for group 1 than for group 2, and the docking time was similar in both groups. Estimated blood loss was also statistically similar. Mean operative time was approximately 127 minutes. All the procedures were completed by the side-docking method without the need for redocking. No significant robot arm collision occurred. The mean hospital stay was 4 days (range, 3-9 days). There was no Clavien-Dindo grade III-V complication in our series.

### Discussion

Radical prostatectomy is currently the 'most performed surgery with robotic assistance. The advantage of such minimally invasive

approaches include less blood loss, a Lower transfusion rate, early recovery, short hospital stay and reduction of nerve injury and urinary incontinence. Robotic surgery has also progressed to other technically demanding urologic procedures, including partial nephrectomy and radical cystectomy. With the advantages of a high degree of freedom and 3-dimensional vision, total intracorporeal reconstructions have become possible. There are increasing reports in published data of the successful. The standard patient positioning for these robotic surgeries has remained the lithotomy position with the surgical robot placed between the patient's legs for docking. This potentially precludes patients who have problems of hip abduction and also introduces potential complications of placement in stirrups, such as compartment syndromes in rare cases and neurapraxia, and there is a same problem in low space operating rooms. This positioning had no effect on robot performance, and the operative technique was not changed. Side-docking techniques in robotic surgery have been reported in the fields of urological procedure, and gynecological and colorectal surgery. The advantage of side docking in colorectal surgery is the enhanced access to both the abdomen and pelvis without the need for re-docking during low anterior resection. Offsetting the robot from the patient's midline axis by side docking does not compromise the surgical performance. In gynecologic cancer surgery, specimens are commonly retrieved through the vagina. Side docking allows full access to the perineum, and thus the specimen can be removed transvaginally without undocking the robot. Specimen retrieval time for large uteri is reduced with robot side docking vs. central docking. Silverman et al reported shorter setup and docking times with their side-docking techniques. Cestari had valued the clinical benefits of "side docking" (SD) of the da Vinci (<sup>®</sup>) robotic system in comparison to "traditional docking" (TD). Cohorts of 120 patients submitted to RARP were prospectively randomized into two groups by docking approach. Reported that no collisions between the robotic arms, and is a reliable method for reducing the setup time of RARP. Simone Albisinni has applied the side-docking technique for over 5 years, mainly in RALP procedures. The series reported includes 268 men undergoing RALP ± extended lymph node dissection (ePLND) between mid-2010 and 2014. Mean docking time, from skin incision to full docking was 13 min. 41% (109/268) of patients underwent simultaneous ePLND, dissecting nodes up till at least the iliac bifurcation. No conversion to open surgery was required. External collisions are infrequent with this configuration: No re-docking was necessary in this cohort. Also Uffort EE valued a side docking vs. central docking in A total of 100 consecutive patients underwent robotic radical prostatectomy for localized prostate cancer. Fifty patients (group 1) were in the standard lithotomy position, and the remaining 50 patients (group 2) were in slight trendelenburg position with the robot at the side of the bed-"side-docked." Mean setup time for group 2 was 4.7 min shorter than for group 1 (p=0.02). Docking time and other operative variables were statistically similar and not affected by the adoption of side-docking technique. However, overall surgical time was longer due to modifications in other aspects of the technique during the study period. Chan had used the side docking in a pelvic surgery and found that all the procedures were completed without the need for redocking. Simultaneous cystourethroscopy was performed in 1 case to localize a bladder diverticular tumor during a partial cystectomy. Manipulation of the uterus and perineum was possible by the second assistant sitting between the patients' legs. No significant collision between the robotic arms occurred. There was no Clavien-Dindo III-V complication in any case. All these reports have claimed no major modification in surgical techniques

with side-docking robotic pelvic procedures. The placement of the patient console is no longer limited by the space between the patient's legs, and extreme abduction of the lower limbs is avoided. This is particularly important for patients in whom leg abduction is limited because of contractures or previous hip surgery. The main advantage of the side-docking approach is full access to the perineum. Rectal injury is a serious complication of radical prostatectomy and other types of urologic pelvic surgery. With side docking, the rectum can be palpated and examined for any injury. Side docking might also serve as a platform for real-time robotic transrectal ultrasound navigation during robotic radical prostatectomy that appears can improve procedure outcomes. As the surgeon progressed along the learning curve in terms of knowing the distances and angles between the robotic arms needed to avoid collisions, the overall setup time was shorter. Major alterations in surgical technique were not required because of side docking, and no change in anesthesia was required. This method of docking has been successfully used on patients of different body habitus including obese patients with conditions that limit the standard lithotomy positioning.

## Conclusion

This exploratory analysis showed that SD approach of the daVinci surgical system for RARP is technically feasible; specifically does not cause collisions between the robotic arms during the surgical time while increasing the working space of the assistant surgeon. Furthermore, requiring less execution time than the CD, SD represents a reliable method to reduce set-up time of RARP. Lastly, the supine position of the patient adopted for SD play an important clinical role in order to prevent neurological complications of the lower limbs in the post-operative setting. In our experience, the learning curve of converting to a side-docking approach consists of only two to three cases. Now we have had an excellent experience with this method as there does not seem to be an increased risk of robotic arm collision as long as the surgeon respects the basic principle of maintaining at least an 8-cm to 10-cm distance between each of the instrument ports, and is used for all pelvic robotic surgery. The limitation of this study is the short numbers of patients, and that the new robot daVinci Xi don't have a problem of docking.

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