Side Docking: An Alternative Docking Method for Gynecologic Robotic Surgery

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The authors propose an alternative method of robotic docking for gynecologic surgery. In this side-docking method, the robot is docked at an approximately 45° angle to the lower torso, aligned with the outer border of either the left or right stirrup, depending on the surgeon's preference for left or right side-docking. The remainder of the patient and trocar setup is similar to traditional docking. The authors 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- to 10-cm distance between each of the instrument ports. The significantly improved access to the vagina and perineum may facilitate robotically assisted gynecologic surgical procedures and reduce assistant fatigue and the potential for injury due to a collision with the robotic arms.
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The use of robotics has increased rapidly since the approval of the da Vinci Surgical System (Intuitive Surgical, Inc., Sunnyvale, CA) for use in gynecologic surgery by the US Food and Drug Administration in 2005.[1] Approximately 9% of hospitals in the United States currently have a da Vinci robot and multiple new sites are added each year. Some of the more commonly performed gynecologic robotic procedures include hysterectomy, myomectomy, sacrocolpopexy, surgical treatment of endometriosis, and gynecologic cancer staging procedures, such as pelvic and para-aortic lymph node dissection.[2] In 2007, Intuitive Surgical introduced the da Vinci S system, an improved second-generation robotic system. Among the most significant improvements of this system are the high-definition display at the surgeon console and increased maneuverability and reach of the robotic arms. The increased reach of the robotic arms provides added flexibility in robotic docking and allows for multiquadrant surgery without moving either the robot or the trocar sites.

The da Vinci Surgical System offers a number of important advantages over traditional laparoscopy, including a wrist-like motion at the end of the instruments and a three-dimensional view of the surgical field. However, some of the disadvantages of the robotic system include lack of tactile sensation, a relatively limited array of available instrumentation, and the large and cumbersome system footprint.[2] The robotic system consists of a surgeon console and a patient cart with four robotic arms. The patient cart is mobile and can be set up next to the patient at any angle; however, in gynecologic surgery, the patient cart is traditionally situated between the patient's legs to maximize instrument maneuverability in the pelvis. This configuration is thought to enable symmetrical trocar positioning, thereby minimizing potential collisions with the robotic arms.

A significant limitation of the traditional docking method is the restricted vaginal and perineal access for the surgical team. Transvaginal access can be an important component of the surgical procedure. Uterine manipulation and palpation of rectovaginal endometriosis are important examples. In addition, transvaginal specimen retrieval can greatly facilitate gynecologic surgery and, in some cases, a rectal probe may be useful, such as in the setting of severe endometriosis or while performing a sacrocolpopexy. Although these challenges can be partially overcome with some maneuvering, transvaginal access with the traditional docking method is clearly inferior to what can be obtained during traditional laparoscopy.

Figure 1. *The robot is aligned along the outside of the left leg, allowing the surgeon easy access to the perineum.*

We propose an alternative method of robotic docking for gynecologic surgery. In this side-docking method, the robot is docked at an approximately 45° angle to the lower torso, aligned with the outer border of the left stirrup (Figure 1). The remainder of the patient and trocar setup is similar to traditional docking. Briefly, the patient is placed in a dorsal lithotomy position in padded stirrups with her arms tucked at the sides. We use a foam mattress that is in direct contact with the patient to prevent sliding during the procedure. Generous padding is also provided for the arms and hands. We use the umbilical port for the camera when dealing with small pelvic pathology, but the camera port can be moved cephalad if needed for larger uteri. The robotic arms on the left are placed at least 8 to 10 cm apart, with the lower port slightly above the anterior superior iliac spine and the upper port triangulated between the umbilical port and the lower port. The right-sided port is then placed roughly parallel to the lower left-sided port. An accessory port is then placed either cephalad and to the right of the umbilical trocar or suprapubically.

We initially experimented with this setup on a pig model in February 2008 and were able to obtain excellent access and mobility for the robotic arms. We subsequently tried side docking for robotic gynecologic procedures at our three medical centers, and since February 2008, we have side-docked the robot for all of our cases, including robotically assisted hysterectomy, myomectomy, vaginal cuff revision, and sacrocolpopexy. In our experience, the learning curve of converting to a side-docking approach consists of only two to three cases, and after having collectively performed a few hundred robotic cases in this manner, our docking times have remained at 3 to 5 minutes. 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- to 10-cm distance between each of the instrument ports (Figure 2). A similar setup has been used by colorectal surgeons for low anterior resections with good success.[3] We have also used this configuration successfully while docking the robot along the right leg. This

Figure 2. *The robot is aligned along the outside of the right leg and there is adequate space for all the arms.*

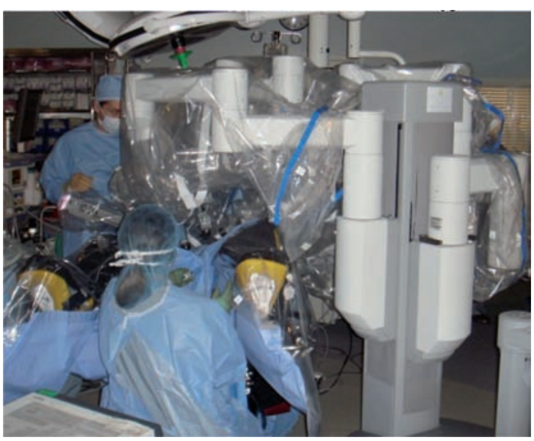

Figure 3. *The assistant can sit comfortably between the patient's legs with the robot docked at the side of the left leg.*

configuration is necessary for surgeons who prefer to place the third and fourth arm on the right side.

The main benefit of side docking is vastly improved vaginal access (Figure 3). An assistant is able to comfortably sit between the patient's legs, and alternatively, an assistant can easily reach down between the patient's legs for uterine manipulation or other tasks. We have not noted any disadvantages with side docking and have enjoyed unrestricted instrument access throughout the pelvis. It is important to mention that most of our experience with side docking is while using the second- and third-generation da Vinci S & Si system. The first-generation robotic system may not be able to offer as much flexibility due to the more limited range of motion of the robotic arms and bulkiness of the system.

Side docking the da Vinci robot may offer gynecologic surgeons important benefits over traditional docking. The significantly improved access to the vagina and perineum may facilitate robotically assisted gynecologic surgical procedures and reduce assistant fatigue and potential injury due to a collision with the robotic arms. We encourage our gynecologic surgical colleagues to try this technique during their next gynecologic robotic procedure. ■

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Main Points

- The use of robotics has increased rapidly since the approval of the da Vinci Surgical System (Intuitive Surgical, Inc., Sunnyvale, CA) for use in gynecologic surgery by the US Food and Drug Administration in 2005. Approximately 9% of hospitals in the United States currently have a da Vinci robot and multiple new sites are added each year.
- The main benefit of side docking is vastly improved vaginal access.
- The significantly improved access to the vagina and perineum may facilitate robotically assisted gynecologic surgical procedures and reduce assistant fatigue and potential injury due to a collision with the robotic arms.