

Making Robotic Surgery Easier and Safer: A Clinical Review

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ABSTRACT

The author proposes an alternative method of robotic docking for gynecologic total robotic hysterectomy surgery. In this side-docking method, the robot is docked on the side of the patient. The remainder of the patient and trocar setup is similar to traditional docking. The author has 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.

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INTRODUCTION

I did not want to learn robotics. I was quite content doing most of my hysterectomies and other gynecological procedures laparoscopically.

I was considered a skilled surgeon by my peers, and I felt good about myself. I felt as though I was part of an elite and talented group of surgeons, who were able to do advanced laparoscopic surgeries and could give their patient multiple minimally invasive alternatives to traditional surgery like LASH, TLH, LAVH, laparoscopic myomectomies, etc. The percentage of my patients requiring an abdominal hysterectomy was about 10% or less, all the more telling when compared with the 70% average in the rest of the USA.

When my hospital administrator Mr Conroy approached me with the possibility of purchasing a DaVinci robot for the hospital and asked for my support, I clearly informed him of my total lack of interest in this new technology. I went on and further reiterated my firm belief that this methodology had no benefits over laparoscopy and was merely a gimmick.

Despite my feelings and reservations, I could not deny the rapid incorporation of this new technique in the USA and the growing claims of potential benefits in using this technology, especially in benign gynecology and gynecological oncology.

To clear my conscience, I decided to go through the motions of learning robotics. Four years ago, my clear and

simple intent was to learn it, do some cases and then walk away from it guilt-free. Then I would have the first-hand knowledge, perspective and practical experience I needed to easily convince myself, my peers and my patients that my initial gut feelings about robotic surgery were correct, that it was indeed a gimmick and provided neither perceived nor actual benefit over traditional laparoscopic surgery.

I had reservations about using this new technology to treat patients who I was convinced I could treat laparoscopically. To overcome my reservations, I only used this technique on very complex cases. The first 10 robotic cases I performed were only on patients who were very obese, very complex and had very large uteri, factors which I knew would lead me to not even attempt laparoscopy to begin with.

Surprisingly, I was able to do seven of those ten complex cases robotically. I was thrilled and realized I had saved seven of my patients from all the potential consequences of a long hospitalization and the longer recovery times typically associated with an open surgery. So I continued to do robotics but only in very select cases.

CONCERNS ABOUT ROBOTICS

But I still was not completely convinced of the benefits of robotics to use as a replacement to laparoscopy. I had the following concerns, which stopped me from incorporating robotics completely in my practice.

1. Lack of control. I was away from my patient and I felt that in the case of an emergency I would not be able to convert to a laparotomy rapidly and easily.
2. There were too many people in the operating room, there were extra staff, Da Vinci reps, an extra anesthesiologist. All this caused too much commotion and confusion.
3. The size, presence and operation of the robot appeared very intimidating and cumbersome.
4. Docking between the legs was especially difficult, it took a long time and appeared very problematic.
5. My assistant was not able to manipulate the uterus the way I wanted, which made the case very frustrating and as I was away from my patient, even I could not manipulate the uterus myself.
6. I was not used to routinely doing port placement above the umbilicus in the right and left upper quadrants, so I felt somewhat out of my comfort zone.

7. The deep trendelenburg worried me and my anesthesiologists.
 8. It seemed as though too much time was being wasted in the turnover time and preparation for a robotic case.
 9. The DaVinci technique of port placement made me have both graspers in my left hand and scissors in the right hand. I felt as though I was not utilizing my fourth arm adequately. A couple of times I felt as though my scissors had drifted from my field of vision.
 10. My case volume was decreasing because both the duration of the case and the turnover time between cases was increasing.
- e. While it is true in my opinion that side docking is more advantageous over between-the-leg docking, it should still be noted that side docking involves a process of positioning the robot at a very particular angle falling on the judgment of two different perspectives. The perspective of the person moving the robot and the perspective of the person directing the robot. That may sometimes lengthens the time it takes to dock the robot. Even after a dock position is set, it may require more than a few attempts before final docking occurs.

MY AHA! MOMENT... IT EXISTS!!!

By the 25th case, my staff and I were finally starting to get comfortable. Then 1 day I made a few changes to my docking technique, changed the port placement and the instrument selection, and that day was my AHA moment. That day the Jain technique started and there has been no looking back.

The benefits of the Jain technique are as follows:

1. Cases are not only easier but also much faster, even compared to laparoscopy.
2. The docking takes my staff on an average 2 minutes, including the placement of instruments.
3. There is easy vaginal access.
4. Port placement is the same in more than 95% cases and can be moved up or down depending on the size of the uterus.
5. Since, we follow the same preparation in almost all the cases, the turnover is now as little as an average 20 minutes.

THE PILLARS OF THE JAIN TECHNIQUE

Parallel Docking

I believe parallel docking is much better and easier than midline or side docking in benign gynecological surgeries. I do not like center midline docking between the legs for the following reasons:

- a. Takes too long.
- b. It is cumbersome and difficult to master.
- c. I do not have access vaginally.
- d. My assistant is unable to push and manipulate the uterus adequately, because either she is sitting between the robot and the patient or she is leaning over the leg of the patient and pushing the uterus with one hand. This is especially concerning given our collective knowledge and experience that inadequate pushing of the uterus increases the incidence of injuries to the bladder and ureters.

Benefits of Parallel Docking

In the last about 300 cases I have done parallel docking. Prior to that we were using side docking.

1. It takes on an average half a minute to bring the robot to the correct spot and perhaps another minute to dock. Add a couple minutes to get the camera and instruments ready and from the time I have put in the ports to the time I start the case it takes me less than 3 to 4 minutes.
2. We need only one person moving the robot. It is no different than parking your car. As long as the robot is parallel to the base of the operating room table with the right base of the robot overlapping about six inches to the side of the operating room table (Figs 1 and 2).
3. I always dock from the patient's right side.
4. I recommend bringing the third arm around the back of the robot to the left side of the robot. In essence, I like to have my first and the third arm on the right side of the patient and my second arm to the left of the patient (Figs 3 and 4).
5. I recommend that assistant stands on the left of the patient.

I believe that it makes the docking faster and more efficient. Many physicians have started to accept this as the primary means of docking.



Fig. 1: View of the robot from the foot of the bed

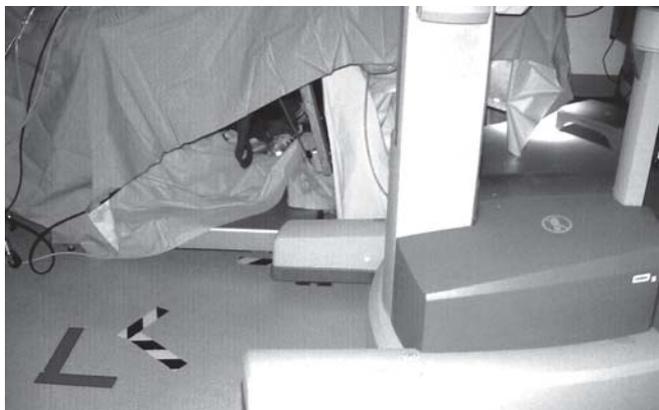


Fig. 2: Relation between the base of the robot and the foot of the bed

PORT PLACEMENT AND INSTRUMENT SELECTION

Where are my Scissors?

The DaVinci technique of port and instrument placement for benign gynecology is to put the scissors on the right side of the abdomen and to put one or two graspers on the left side of the abdomen. It could be a W or a M placement. Therefore, if you are right handed you have two graspers that you are toggling in the left hand while dissecting and cutting with the scissors in the right hand. I feel that my ability to use the two graspers to their full capacity was compromised in the Da Vinci technique, and thus the invention of the Jain technique.

The Jain technique of port and instrument placement is opposite to the DaVinci technique and practically eliminates this limitation. I recommend the following.

Port Placement and Docking Technique (Figs 5 and 6)

1. Dock the first and the third arms of the robot on the right side of the patient's abdomen. As I mentioned



Fig. 3: Robot is docked on the right side of the bed

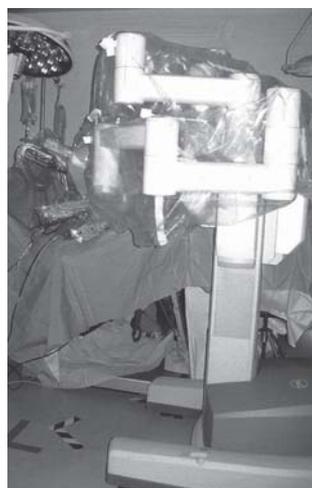


Fig. 4: Third arm is brought to the right side of the robot

earlier, bring the third arm around the back of the robot to the left of the robot.

2. Always dock the third arm first and then the first arm, it makes the docking easier.
3. Dock the second arm of the robot to the left of the patient's abdomen.

Instrument Selection Procedures (Figs 7 to 9)

1. Put the unipolar scissors in the first arm, which is usually in the right upper quadrant.
2. The fenestrated bipolar or a grasper goes in the third arm in the right lower quadrant. I have a separate foot pedal next to my right foot for the Bipolar graspers.

I switch between my scissors and the fenestrated grasper in my right hand. So you see that I either use my scissors or I use the fenestrated bipolar. In essence, when I use my fenestrated bipolar in the third arm, then my scissors in the first arm are fixed and thus cannot move or get lost reducing the risk of inadvertent injury to vital structures. On a side note, when I am not using the scissors, I leave them near the anterior abdominal wall, away from the bowel and vascular structures.

3. I put the Gyrus grasper in the second arm on the left lower or mid quadrant of the patient's abdomen.
4. My assistant port could be in suprapubic or in the left upper quadrant. The site is dependent on the size of the patient and the pathology.

Note: If I have a clear vision of the pelvis with no redundant bowel, I use a suprapubic port. That port is used essentially for suction irrigation, passage of the suture and removal of the specimens. However, if I see a need for exposure and bowel retraction, I use the assistant port in the left upper quadrant. It is easier for the assistant to then use a retracting device like a paddle or a fan retractor.

In cases of endometriosis resection, I use my bipolar graspers to pull the peritoneum with endometriosis away from vital structures like the ureters, bladder, bowel and the blood vessels. I then use the scissors and the Gyrus to superficially remove the pathology.

Another benefit with the Jain technique is that the two graspers are coming from two opposite sides, which make the retraction and dissection much easier, closely duplicating an open laparotomy.

Also use of the two graspers are very convenient for traction and pulling organs away from vital structures. I believe doing this makes the anatomy clearer and the areas of dissection much more distinct, specifically in robotic cases with the 3D vision.



Fig. 5: Positioning of the arms prior to docking



Fig. 8: Right side view of docked 1st and 3rd arm



Fig. 6: Positioning of the arms after docking

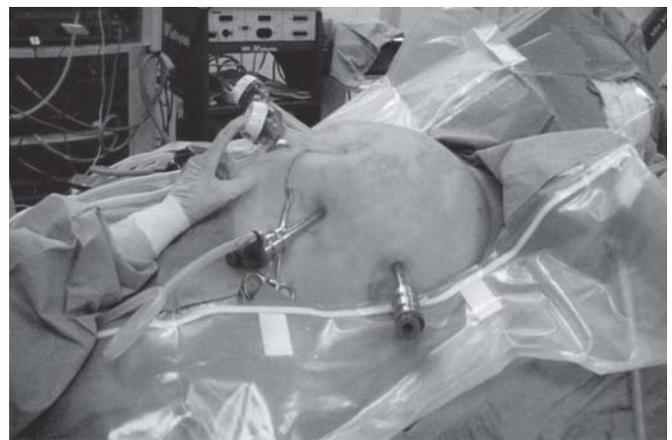


Fig. 9: Usual port placement in Jain technique



Fig. 7: View of the docked robot from the head of the patient

UTERINE MANIPULATION BY RUMI POSITIONING SYSTEM

Every surgeon has his or her preferences for using particular instruments. I have used a Rumi intrauterine manipulator in all my cases and feel that it is an integral part of my surgical technique (Fig. 10). I feel it delineates the anatomy better for me than any other uterine manipulator.

It offers full anteversion, retroversion and lateral positioning. Articulates at the cervix to provide extreme uterine mobility and traction in any direction. The Koh's rings make it much easier to do colpotomy anteriorly and posteriorly. L-shaped locking handle permits repositioning from the surgical field for complete access.

A starter pack which includes the handle and enough tips to perform 10 procedures is offered.

It is very beneficial when used for myomectomies, specially with the Rumi positioning system which is attached to the bed and maintains the position of the uterus. This reduces assistant exhaustion, which often prevents the assistant from pushing the uterus superiorly.

The Rumi retractor (Fig. 11) has an elbow which I believe delineates the fornices very clearly and makes the incision for colpotomy much easier to make compared to other manipulators. I do not suture the Rumi to the cervix.

In addition to using the Rumi I also believe it is important to make sure the assistant who manipulates the uterus is pushing the uterus very firmly. Pushing the uterus superiorly will reduce the chances of injury to ureters and the bladder.



Fig. 10: Unassembled Rumi with three Koh's rings and a vaginal occluder



Fig. 11: Assembled Rumi retractor

CONCLUSION

In closing, I would like to mention that I have done approximately 430+ cases using the Jain technique. A significant percentage of the cases have been very complex surgeries with large uteri, 350 lb patients, large fibroids for myomectomy, very dense adhesions from multiple prior surgeries or chronic PID (pelvic inflammatory disease), yet despite this myriad of compounding conditions, all the cases were quick, smooth and without complications.

In each and every case I have used the same docking technique, port placement and instrument selection and have always been more than pleased with the ease of the procedure, my patient's progress and their recovery. In cases of large uteri and complex pathology, the only change I make is to move my ports superiorly.

Last, now that endometriosis resection over ablation is being recognized as the standard of care, learning robotics has become even more necessary. With the Jain technique, excising endometriosis from hard to reach areas, like pelvic side walls, ureters, uterine vessels, bowel, etc. would become easier.

As I mentioned earlier, 4-year-ago, my clear and simple intent was to learn robotic surgery, do a few cases, prove to myself that it had no benefits over laparoscopy and then walk away from it guilt-free. To my surprise, for the last 2 years I have not felt the need to do a laparoscopy. I am convinced that as a robotic surgeon I can do my cases faster and better than I could do with any other modality.

My laparotomy rate has dropped markedly to almost less than 2% since I have incorporated robotics in my practice. Out of the three cases I had to open in last 1 year, except for one case with multiple fibroids, which I was unable to complete robotically the other two were found to be bowel tumors, a GIST and a sarcoma of the small bowel, and a colorectal consul to be requested intraoperatively.

I am very honored to have been able to present my technique. I hope it reduces the learning curve and increases the incorporation of robotics in a physician's practices. I believe robotic surgery is a win-win for both the patient and the surgeon compared to traditional laparoscopy, which is definitely a win for the patient but may be a lose for the surgeon, especially in difficult surgeries.

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