

EDITORIAL

Robotic Surgery and its use in Pakistan

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INTRODUCTION

The advancement of robotic surgery truly began in the year 2000 when Food and drug administration FDA approved Da Vinci Surgical system made by American company Intuitive Surgical.¹ The system was designed to help surgeons deal with complex procedures while maintaining the minimally invasive approach. The system incorporates 3 basic components. One is the patient cart with robotic arms that is docked at the patients table. The vision cart incorporates the hardware to run the system including the camera and the light controls. Finally the surgeons console is a platform where surgeon controls the movements of the robotic arms. All three are linked by fiber optics. The surgeons console can also be hooked via network making it possible to do telesurgery. The first case of robotic surgery was done in this manner where the patient was in France, Strasbourg and the operating surgeon was in America.

Robotic surgery has several advantages over laparoscopy. This includes 2 cameras which give 3 dimensional views. Whilst the view is superior the other advantage of 3D is that the surgeon is able to perceive depth leading to enhanced perception of the surrounding. The other major advantage of robotics is the way the instruments are designed giving it a wrist joint. The traditional laparoscopy instruments have only 4 degrees of movement that is in/out, up/down, left/right and rotation while the robotic instruments due to the presence of a wrist have seven degrees of movements which not only achieve precise movements but is also natural and comfortable for the surgeon. Since the

robotic arms are mechanical therefore movements are very precise and with the help of the software the tremors of the operating surgeon can be filtered, preventing its transmission to the robotic arms.²

The drawback is that training and a dedicated team is required. The patients cart is quite bulky and there is an initial learning curve to control it and achieve ideal position for surgery. Also during surgery the patients cart may need to be moved to deal with different quadrant of the patient. This requires removing the instruments and redocking. All this adds to the time of the surgery and therefore the cost. One of the major drawback of robotic surgery is that there is no tactile feedback to the surgeon. This is particularly troublesome when suturing as the thread and sometimes the needle is broken because of excessive force applied by the instruments. One of the major hurdle to its widespread use is the cost of the system including its maintenance.² The instruments are programmed for an average 10 uses after that they cannot be used again and become inactive.

With the advancements and the newer generation of the robotics, the optics has further improved. The patients cart in the newer models are less bulky and have a rotatable arms assembly leading to multi quadrant surgery without undocking. The newer models also can be linked to the operating table, where movements of the table are synchronized with the robotic arms. Previously in older versions the table position could not be changed after docking the instruments but this has changed and now with this new system, the position of the table can be changed without undocking. Further work is going on to develop haptics in

robotics which gives tactile feedback to the surgeons.³

The long standing debate between laparoscopy and robotics is never ending. This could be tackled if we consider robotics to be the next generation of laparoscopy. An advanced version of laparoscopy! Whereas the laparoscopy is less user friendly to the surgeon, the robotics on the other hand is designed to keep the surgeons comfort in mind. Comparative studies with laparoscopic surgery has shown mixed results with most studies showing no benefit over laparoscopic surgery but demonstrating its safety and efficacy.²

In 2011 Pakistan acquired its first DaVinci robot. This was the DaVinci S system which was installed in Sindh Government Qatar Hospital in Karachi. As proper feasibility was not undertaken before its acquisition and installation therefore only 50-60 cases could be done on this system before it went out of order and could not be revived due to unavailability of funds for its maintenance and instruments procurement. The second robotic platform (DaVinci Si) was installed in the operation theatre complex of Civil Hospital Karachi in 2013.² Since then more than 500 cases have been done in collaboration with Sindh Institute of Urology and transplantation (SIUT). Sindh Government has been providing the funding for 150 cases yearly and therefore there is no cost to the patient. But this model cannot be applied to a private setup where the cost of doing a robotic surgery will be prohibitive. In order to monitor the progress and standards the intuitive surgical have stopped further sales of the robotic systems to Pakistan. Compare to India where more than 30 health care centers are performing robotic surgery, we have only one center for the whole country.

The cost of a robotic platform is around 350 million Rs. along with 10% of the cost being the annual maintenance contract. The robotic

instruments have limited life roughly around 10 uses before they are rendered unusable. The mean cost of a single robotic instrument is around Rs. 529,310.57^{2,4}. The average cost of doing a single robotic surgery comes to around Rs. 550,000. This cost only includes the robotic instruments and the daily maintenance contract charges.

Robotic surgery is not going to disappear. The technology will improve with new generations. The size, cost and functions will improve considerable. With the development of robotics by other companies the cost will further reduce and with its widespread use it will become cost effective and feasible to use.^{4,5} The future will be truly robotic, where the surgeons will be supervising whilst the surgery will be performed by the robots. Proper feasibility and planning should be executed before its acquisition so that it can be used with proper indications and where it definitely has an edge over laparoscopy. We should also focus on training programs where surgeons are trained in robotics so that we are prepared when robotics become the norms of surgery.

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