

Current Status of Robotic Surgery in India

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Abstract: Robotic surgery allows the surgeon with no previous laparoscopic training to provide the patients with the advantages of minimal access surgery. For the laparoscopically trained surgeon it enables operating at a superior level with greater precision and accuracy. In India, robotic surgery is still in its infancy. There are eight robots installed in India, of which five are in New Delhi, one in Chennai, one in Nadiad and another in Pune. The All India Institute of Medical Sciences has been at the forefront of the robotic revolution in India. India now stands at the cusp of a robotic revolution. Robotic surgery in India is here to stay and it is up to us as minimally invasive surgeons across different specialties to lead the way and make maximum use of robotic surgery.

INTRODUCTION

The arrival of surgical robotics at the turn of the millennium has ushered in a new era in minimally invasive surgery. From its humble beginnings, with the introduction of primitive robots like the PUMA, PROBOT and ROBODOC (which were in-fact industrial robots adapted for medical use) to the current state-of-the-art da Vinci Si surgical system, robotic surgery has come a long way. The reason behind the unprecedented explosion in the use of robotics lies in the inherent advantages of robotic surgery over conventional laparoscopic surgery which include superior ergonomics, enhanced magnification, 3D-vision, motion scaling, tremor filtering, enhanced dexterity, precision and control of operating instruments. From the patients' perspective this translates to smaller incisions, decreased blood loss, less pain, and quicker healing time and consequently reduction in hospital stay. Rapid dissemination of the technology and technique, together with aggressive marketing has captured the imagination of the doctors and patients alike. Robotic surgery allows the surgeon with no previous laparoscopic training to provide the patients with the advantages of minimal access surgery. For the laparoscopically trained surgeon it enables operating at a superior level with greater precision and accuracy.

Among the surgical fraternity, urologists were one of the earliest to truly realize the immense potential of robotic surgery. Robotic surgery has initiated a paradigm shift in the fundamental foundations of surgery. Robotic radical prostatectomy has now become a validated treatment option for localized prostate cancer. There are now more than 1000 robots in the United States alone and there has been an exponential rise in the utilization rates. As per unpublished data released by Intuitive surgical Inc., there were more than 55,000 radical prostatectomies performed by with da Vinci robotic assistance in the United States in 2007 and more than 70,000 performed worldwide in 2008. This translates to more than 70% of radical prostatectomies being performed with robotic assistance. The increasing popularity of robot-assisted surgery has caught up in Europe, Asia and Australia and has spread to other specialties like cardiothoracic surgery, gynecology, otorhinolaryngology, surgical oncology, gastro-intestinal and bariatric surgery and general surgery. In India, robotic surgery is still in its infancy. There are eight robots installed in India, of which five are in New Delhi, one in Chennai, one in Nadiad and another in Pune. The All India Institute of Medical Sciences has been at the forefront of the robotic revolution in India. The first robotic radical prostatectomy in India was performed in A.I.I.M.S. New Delhi in July 2006. Since then over 200 robot-assisted laparoscopic radical prostatectomies have been successfully carried out. The perioperative outcome of the first 190 cases has been analyzed (Dogra PN, Javali TD et al, Indian Journal of Urology, epub. ahead of print), which is comparable to most contemporary western series. Long-term follow-up results are now available and the excellent functional and oncological outcomes are noteworthy.

Other urological procedures that have been performed with robotic assistance include extirpative oncological surgeries like radical cystectomy, anterior pelvic exenteration, radical nephrectomy, adrenalectomy and ilio-inguinal lymph node dissection. Reconstructive surgeries like pyeloplasty, vesicovaginal and ureterovaginal fistulae repairs and stone surgeries like pyelolithotomy and ureterolithotomy.

Other specialties have now hopped on to the robotic bandwagon. Using the robotic system, gynecologists are now performing radical hysterectomies and myomectomies.

ENT surgeons are performing robot-assisted surgery in the nasopharynx and oro/hypopharynx for benign and malignant lesions to achieve better

functional results compared to traditional open surgery. Many types of gastrointestinal procedures are being performed with robotic assistance. These include colorectal surgeries, esophageal fundoplication, pancreaticoduodenal procedures and bariatric surgeries. In the cardiothoracic arena, totally endoscopic coronary artery bypass grafting, mitral valve repairs, lung resections, esophagectomy and thymectomy have become commonplace.

A major reason why robotic surgery in India has not progressed at a faster rate is the financial factor. Intuitive surgical controls the monopoly in marketing. The da Vinci system sells for about \$ 1.2 million. The new da Vinci HD SI released in April, 2009 currently sells for \$1.75 million. The annual maintenance costs along with the disposable supply cost (\$ 1500 per procedure) makes it beyond the reach of many institutions and health care systems. A robotic radical prostatectomy at A.I.I.M.S. costs around INR 1.3 lakhs per case, which is much lower than the market price of Rs. 3 lakhs. The only way to tackle this and to make robotic surgery financially feasible is for multidisciplinary utilization of the robotic system to its fullest potential. The maintenance costs remains the same whether one case or 6 cases are done in a day. So it is logical that if more cases were generated out of a robotic system, the cost per case would automatically decrease. Government support is also of paramount importance to help in dissemination of robotic technology so that it becomes available to the common man at a subsidized rate. The media also has an important role to play in spreading awareness among the public about this new technology. Similarly the primary care physicians need to be made aware so that they can refer the cases to the robotic centers.

Another way to reduce costs would be to develop indigenous surgical robots. With the possibility that Intuitive surgical may run out of its patent by 2011, this is a viable alternative. However developing as sophisticated a machine as the current da Vinci system seems to be a Herculean task at the moment, although the department of biomedical engineering at the Indian Institute of Technology have made some headway in the goal of developing our very own Indian prototype.

Another major drawback with the current Indian scenario is the lack of robotic surgery fellowships in India. As robotic technology has not entered the mainstream health care system there is a lack of access to the technology and a deficit in educational opportunities. Young Indian urologists wishing to specialize in robotic surgery need to go abroad to get trained in the nuances of robotic surgery. How many of these surgeons do actually come back after their training? So robotic surgery fellowships are the need of the hour at present if we wish to take robotic surgery to the next level in India. Another drawback is the lack of evidence-based evaluation of robotic surgery outcomes from the high volume centers in India. Critical evaluation of our results is necessary to understand our shortcomings and help in progress.

Much like the robots in popular culture, the future of robotics in surgery is limited only by imagination. Newer developments include the incorporation of the TilePro™ multi-image stereo viewer which enables simultaneous display of multiple video inputs in the surgeon console, integrating display of the patient's ultrasound, CT, and MRI images; incorporation of haptic feedback and wireless technology. Newer robotic surgical platforms like miniature robotics and flexible robotics are on the horizon.

India now stands at the cusp of a robotic revolution. Robotic surgery in India is here to stay and it is up to us as minimally invasive surgeons across different specialties to lead the way and make maximum use of robotic surgery.