

# ROBOTIC SURGERY IN MODERN WORLD

## Abstract

Origin of Surgery - trepanation , 31000 years uni system & patient side cart It is currently used in protatectomy, oncological surgeries & gynaecological problems Setting up of robotic system - its very expensive , consist of 5 phases Robotics is set to replace doctors in anaesthesia

**Advantages :** 3d Vision  
Tremor Reduction  
More Degrees of Freedom

**Scaling of Movement:** Fine Dissection And Suturing

**Keywords:** Robotic Surgery, Anaesthesia, Health System.

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## **I. ORIGIN OF SURGERY**

The initial surgical methods were created to address wounds and traumas. Trepanation, in which an aperture was made by procedure, is the oldest operation for which there is documentation. Borneo performed the first surgical amputation approximately 31,000 years ago. The distal portion of the patient's left lower leg was amputated during the procedure. WITH time need for new techniques kept on increasing, that lead to origin of new techniques like Artificial Intelligence, Robotic Surgery, Nano Technology Etc

## **II. ORIGIN OF ROBOTIC SURGERY**

National Aeronautics and Space Centre (NASA) developed the concept of robotic surgeries around late 1980s Robotic-assisted treatments have grown in number during the last ten years, as have publications about robotic-assisted laparoscopic surgery. Robotic surgery will be crucial to improving the global and Indian health systems.

## **III. FUNCTIONING OF ROBOTIC SURGERY**

The main principle of robotic surgery is – Master & Slave Concept.

With robotic technology, there is a rare chance to manage an operation from a remote location without the need for human operators who are knowledgeable and experienced.

The only robotic system commercially available is DA VINCI ROBOTIC SYSTEM. The da Vinci system was approved for general surgery by the FDA in 2000, for the use in urology in 2001 and for gynaecology in 2005.

## **IV. DESCRIPTION OF TECHNIQUE**

The da Vinci robotic system, developed by Intuitive Surgery, comprises three main components. The first component is the surgeon's console, which allows the surgeon to remotely instruct the robotic system. The physical location of the console is flexible. During the procedure, the surgeon views a stereoscopic image displayed on the console and manipulates the robotic arms using hand controls and foot pedals. This setup provides optimal hand-eye alignment. While the surgeon has limited haptic feedback, reliance is primarily on visual feedback.

The second component is the Insite Vision System, which creates a three-dimensional (3D) view using two camera control units and two built-in light sources within the unit. A 12-mm endoscope is utilized, providing a magnification of six to ten times for the operating field. The 3D view enhances visual feedback, enabling the surgeon to work with precision even in the absence of significant haptic feedback. The robotic visualization system offers high-definition vision, resulting in higher resolution, improved clarity, and enhanced detail. Additionally, digital zoom functionality minimizes interference between the endoscope and instruments. The third component is the patient-side cart, featuring the robotic arms for surgical procedures. The initial series of da Vinci systems featured three robotic arms, while the new series is equipped with four robotic arms. These robotic arms are paired with the

EndoWrist instruments, which are integral to the system's functionality. Each wrist possesses a total of 7 degrees of freedom, akin to the human hand. The surgeon's hand movements, particularly fingertip motions, are precisely replicated by the computer in the corresponding instrument movements. Motion scaling, with a scaling factor of up to 1:10, enables the execution of highly precise tasks. The computer also filters out normal physiological hand tremors and eliminates the reverse-fulcrum effect commonly observed in traditional laparoscopy.

For different types of surgeries, a range of specialized instruments is available (see Figure 5). The software is of utmost importance, serving not only to control the robot but also to provide safety features. This includes a multi-input display that integrates critical patient information and built-in telestration capabilities for proctoring and team communication.

Training is becoming more and more necessary as robot-assisted laparoscopic surgery becomes more common. Compared to open surgery, conventional laparoscopic surgery calls for different knowledge and training. One can learn basic laparoscopic skills using a virtual reality headset, a cadaver, or a box trainer.<sup>128</sup> One can receive training for particular procedures in a virtual reality setting or on a cadaver. Robotic surgery provides a three-dimensional (3D) vision for the surgeon, enabling faster and more efficient work completion than traditional laparoscopy.<sup>150–149</sup> Unlike open surgery, the fundamentals of laparoscopic and robotic skill scanning significantly improve with a comparatively brief and thorough instruction. The question is whether this improvement leads to a better surge and how to sustain it after a course.

## V. CURRENT USES OF ROBOTIC SURGERY

IT can be used in Prostatectomy, Hysterectomy, Oncological Surgeries, Gynaecological Procedures

**1. Setting up a Robotic Program:** The need for knowledge about setting up a robotic program is rising due to the increased interest in robotic surgery and its encouraging outcomes. A robotic program needs to be put up in five crucial steps. Creating a business strategy that explains the first robotic program and asks for the necessary administrative support is the first stage. The second stage is execution, during which the design of the theater, the personnel, the acquisition of a robotic system, sterilisation facilities, marketing, and a skilled lead surgeon must all be considered. The program's execution is the third stage. succeeded by a maintenance phase. A suitable data system for quality assurance, efficiency, and results, together with the ability to track patient satisfaction, are necessary for this fourth phase. It should be possible to access an organized program for the training and education of fellows and residents. The last stage involves expansion to ensure the program's viability, at which time more surgeons may be hired or trained to collaborate with other subspecialties. Most essential, a committed theater team is required.

## VI. USE OF ROBOTICS IN ANAESTHESIA

Once the robot has been set up, the anesthesiologist's immediate access to the patient becomes restricted. As a result, all necessary lines, monitors, and patient-protective devices

must be positioned in advance and securely fastened to prevent any kinking or displacement. It's important to note that any changes in the patient's position or access to the patient are impossible without first detaching the robot. This time delay in patient management can potentially lead to critical complications, especially in cases involving unhealthy patients or children. Therefore, it is essential to ensure early problem detection by the anesthesiologist and provide training to the surgical team on the swift detachment of the robotic system in emergency situations.

Furthermore, it is crucial to avoid any patient movement during surgery. Any unintended patient movement while the robotic instruments are docked has the potential to result in the tearing or puncturing of internal organs and vasculature, with potentially catastrophic consequences [20].

The requirements of robotic surgery can lead to surgical positioning that is notably more extreme and steeper compared to traditional or laparoscopic procedures. These extreme positions elevate the risk of patients inadvertently sliding off the operating room table, necessitating the use of restraints. Furthermore, certain extreme positions may induce physiological changes in patients. In addition to this, the presence of bulky robotic arms, combined with the extreme positioning and extended durations of the surgical procedures, poses a potential risk of positioning-related injuries for patients [27]. Therefore, it is crucial for the anesthesiologist to pay close attention to both the robotic arms and the patient's position in order to prevent pressure or crush injuries. In a particular center, incidents of positioning injuries were documented in 6.6% of 334 robot-assisted adult urological procedures [27], with longer operation durations and deteriorating patient conditions identified as significant risk factors [27].

Some surgeries, such those of the upper abdomen, thoracic, or head and neck, need that the patient's airway be placed farthest from the anesthesiologist's desk and anaesthetic equipment. It is nearly impossible to enter the airway during these procedures [2].

In robotic surgery, CO<sub>2</sub> pneumoperitoneum or capnothorax are necessary when dealing with intrathoracic or intra-abdominal disorders. During laparoscopic surgery, a number of problems associated with these disorders have been observed, including subcutaneous emphysema, pneumothorax, pneumomediastium, and, in the worst case scenario, gas embolism.

## **VII. ETHICAL ISSUES REGARDING ROBOTIC SURGERIES**

The rising intricacy of contemporary surgical technology will necessitate stricter operating and practice norms, akin to the discipline used to robotics. Principal moral concerns are Patient safety, professional ethics, transparency, innovation, surgical outcomes, conflict of interest.

One of the main ethical issue is that only rich can arrange it. So government should put some efforts to decrease the overall cost of robotic surgeries.

## **VIII. ADVANTAGES OF ROBOTIC SURGERY**

- 3D Vision
- Tremor Reduction
- More Degrees of Freedom
- Scaling of Movement – Fine Dissection and Suturing
- Disadvantages Of Robotic Surgery
- Expensive
- Longer Learning Curve
- Loss of Tactile Feedback

So, the robotic surgical system has some clear advantages compared with conventional laparoscopic procedures

## **IX. FUTURE OF ROBOTICS IN HEALTH SYSTEM**

As robotics in general and aided surgery in particular continue to advance, it is reasonable to assume that the use of this technology will only grow. Robotic systems will become smaller and simpler to operate in the near future. After the covid pandemic, various countries have increased their budget expenditure towards health system including India, so number of robotic surgeries will be increased in future. At last, one would not be wrong if he says that robotic surgeries will play major role in improvement of health set up in INDIA and in all over the world

## **REFERNCIES**

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