ROBOTIC SURGERY

ORIGIN OF SURGERY

The first surgical techniques were developed to treat injuries and traumas. The oldest operation for which evidence exists is **trepanation**, in which a hole is drilled or scraped into the skull for exposing the dura mater to treat health problems related to intracranial pressure and other diseases. The oldest known surgical amputation was carried out in Borneo about 31,000 years ago. The operation involved the removal of the distal third of the left lower leg. **WITH time need for new technuques kept on increasing, that lead to origin of new techniques like ARTIFICIAL INTELLIGENCE, ROBOTIC SURGERY, NANO TECHNOLOGY etc**

**ORIGIN OF ROBOTIC SURGERY**

The ﬁrst concept of surgical robotics was developed in the late1980s at the National Aeronautics and Space Centre (NASA)

Over the past decade, there has been an increase in growth of robot-assisted procedures and of publications concerning robotic-assisted laparoscopic surgery. Robotic surgery will play important role in upliftment of health system in INDIA as well as world .

FUNCTIONING OF ROBOTIC SURGERY

The main principle of robotic surgery is – **MASTER & SLAVE CONCEPT** .

Robotic technology offers the unique opportunity to control the operational process outside the actual location, with the skilled and often expert operators not necessarily being physically present.

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

DESCRIPTION OF TECHNIQUE

The da Vinci robotic system (Intuitive Surgery) has three major components . The ﬁrst component is **the surgeon console**. The surgeon sits ergonomically behind the console and controls the robotic system remotely. The con-sole can be placed anywhere in or even outside the operating room. While operating, the surgeon is viewing a stereoscopic image projected in the console and controls the robotic arms with hand manipulators and food pedals. The position pro-vides an optimal hand–eye alignment. The surgeon has limited haptic feedback, so one should rely on visual feedback. The second component is **the Insite Vision System** . A three-dimensional (3D) view is created withthe use of two camera control units and two light sources , built in the unit. A 12-mm endoscope is used. The viewer gives a six to ten times magniﬁcation of the operating ﬁeld. Because of the 3D view, the visual feedback is excellent and allows the surgeon to work very precisely, even without haptic feedback. High-deﬁnition vision is available in the robotic visualisation system, providing higher resolution and improved clarity and detail. Finally, the digital zoom reduces the interference between endoscope and instruments. The third component is the patient side cart with the robotic arms. The ﬁrst series of da Vinci systems had three robotic arms, and the new series all have four robotic arms.Attached to the robotic arms are the EndoWrist instru-ments. These instruments are one of the key components of the system. The wrist has a total of 7 df similar to the human hand . The surgeon’s hand (ﬁngertip) movements are translated by the computer to the same movements of the instruments. Motion scaling (up to 1:10) is making it possible to perform very precise tasks. The computer also ﬁlters out normal physiological hand tremor and avoids the reverse-fulcrum effect that occurs in traditional laparoscopy. Depending on the type of surgery to be performed, there are various instruments available (Figure 5). The software is important not only for the functioning of the robot but also to provide safety features, such as a multiinput display allowing an integrated view of patient critical information and the built-intelestration for proctoring and team communication.

With the implementation of robot-assisted laparoscopic surgery, there is also an increasing need for training. Conventional laparoscopic surgery requires different skills and training compared with open surgery. Basic laparoscopic skills can be obtained in a box trainer, in a cadaver or with virtual reality.148 Training for speciﬁc procedures is possible in a cadaver or in a virtual reality environment. In conventional laparoscopy, the surgeon has a two-dimensional (2D)view, while in robotic surgery, the view is 3D, allowing tasks to be performed quicker and more efﬁciently.149–151 In contrast to open surgery, the basic laparoscopic and robotic skill scan improve signiﬁcantly in a relatively short-intensive course. Question is how to maintain this improvement after a course and whether this improvement translates to better surge.

CURRENT USES OF ROBOTIC SURGERY

IT can be used in **ROBOTIC RADICAL PROSTATECTOMY, ROBOTIC RADICAL HYSTERECTOMY, ONCOLOGICAL SURGERIES, GYNAECOLOGICAL PROCEDUES**

**Setting up a robotic program**

With the growing interest in robotic surgery and the promising results, there is an increasing need for information how to set up a robotic program. Palmer et al. describe ﬁve essential phases to set up a successful robotic program. The ﬁrst step is the development of a business plan, deﬁning the initial robotic program and arrange proper administrative support. The second phase is the implementation in which one must think of the theatre design, the theatre team, the purchase of a robotic system, sterilisation facilities, marketing and an expert lead surgeon. The third phase is the execution of the program. Followed by a phase of maintenance. In this fourth phase, one should have a proper data system for quality control and efﬁciency and outcomes as well as patient satisfaction should be registered. A structured program for training and education of fellow’s/residents should be avail-able. The last phase is growth to make the program proﬁtable, where one could think of recruitment or training of new surgeons working together with other subspecialties. Very importantly, there is a need for a dedicated theatre team**.**

**Robotics and anaesthesia**

Danic et al. describe anaesthetic considerations in 1500 radical prostatectomies.Some special arrangements have to be made when performing robot-assisted surgery in the pelvis. Preoperatively, there is no need for a full bowel preparation, but it is advisable to use a laxative on the day before surgery. During the operation, special attention must be given to the positioning of the patient. Cushioned stirrups should be used to place the patient in lithotomy position. During the operation, steep Trendelenburg position is used and the patient is prone to slip of the table.One can use a chest binding in an ‘x’-like pattern over the acromia to prevent this, paying attention to pressure areas. The most common anaesthesia-related complication (3% of the cases) was corneal abrasion, despite the use of eye tape. This could be signiﬁcantly reduced with the use of eye patches. Constant positive airway pressure of 5 cmH2O preserves arterial oxygenation during prolonged pneumoperitoneum. Baltayian published a comprehensive overview of anaesthetic consideratiions and detailed anaesthetic management for robot-assisted radical prostatectomy. This could be of help for centres starting a robotic program and where the anaesthetists arenot familiar with the speciﬁc measures for these type of procedures**.**

**LITIGATION AND ETHICAL ISSUES**

The increasing complexity of modern surgical technology willrequire more stringent guidelines for operation and practicesimilar to the discipline exercised in aviation. Using a surgicalrobot implies that the surgeon is no longer in direct physicalof visual contact with the patient. The surgeon not only oper-ates through computer commands but there is also a physicaldistance to the assistants attending the operation table.Unfortunately, the current systems lack a satisfactory way tocommunicate between the operator and the assistants. Aswith many new technological advances, communicationmight appear the Achilles’ heel of robotic surgery. Moreappropriate equipment of communication and more strictdiscipline in follow up of the commands from the primaryresponsible person, the surgeon, will be essential for a safe andsuccessful procedure

**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 laparoscopical procedures**

FUTURE OF ROBOTICS IN HEALTH SYSTEM

Considering the development of robotics in general and assisted surgery in particular, it is to be expected that the application of this technology will only increase. In the near future, the robotic systems will become smaller and easier to handle . **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**