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 opening was created by procedure. First surgical amputation was done by. Borneo around 31,000 years ago. The operation involved the removal of the distal third of the left lower leg. **WITH time need for new techniques kept on increasing, that lead to origin of new techniques like ARTIFICIAL INTELLIGENCE, ROBOTIC SURGERY, NANO TECHNOLOGY etc**

**ORIGIN OF ROBOTIC SURGERY**

National Aeronautics and Space Centre (NASA) developed the concept of robotic surgeries around late 1980s

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.

**Th**e 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.

DESCRIPTION OF TECHNIQUE

The da Vinci robotic system (Intuitive Surgery) has three major components . The ﬁrst component is **the surgeon console**. The second one is PATIENT CART and the Third one is VISION CART. The surgeon sits behind the console and instructs the robotic system remotely. It doesn’t matter where the console is placed . 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 **PROSTATECTOMY, 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. There are ﬁve essential phases to set up a successful robotic program. The ﬁrst step is the construction of business plan, explaining the initial robotic program and requesting 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**.**

**USE OF ROBOTICS IN ANAESTHESIA**

. After the robot has been set up, the anesthesiologist is unable to readily access the patient. Thus, any lines, monitors, and patient-protective devices must be placed beforehand and should be secured to ensure no kinking or displacement. It is impossible to allow changes in patient position or any kind of access to the patient if the robot is not detached first. Because this time delay in patient management may result in critical complications, especially in unhealthy patients or children , early detection of any problems by the anesthesiologist and training of the surgical team for fast detachment of the robotic system in emergency situations is needed. Additionally, no type of movement is allowed during an operation. Movement of the patient while robotic instruments are docked could lead to tearing or puncturing of internal organs and vasculature, with potentially devastating consequences [20].

According to the type of operation, robotic surgery may require surgical positioning that is relatively extreme and steeper than in other conventional or laparoscopic surgery. These extreme positions increase the risk of patients sliding off the OR table, making the use of restraints inevitable. Some of these extreme positions may even cause physiological changes. Additionally, bulky robotic arms accompanied by extreme positioning and prolonged operation durations place patients at risk of positioning injuries [27]. The anesthesiologist should give attention to the robotic arms and the patient position to prevent pressure or crush injuries. In one center, positioning injuries were documented in 6.6% of 334 robot-assisted adult urological procedures [27]. Longer operation durations and worse patient conditions were found to be significant risk factors [27].

Some procedures, such as upper abdominal, thoracic, or head and neck surgeries, require the patient's airway to be situated away from the anesthesiologist and anesthesia workstation. During these procedures, access to the airway is almost impossible [2].

Robotic surgeries regarding intrathoracic or intra-abdominal pathologies require the use of CO2 pneumoperitoneum or capnothorax. Many complications related to these conditions have been noted during laparoscopic surgery, such as subcutaneous emphysema, pneumothorax, pneumomediastium, and, in the worst case, gas embolism.

**ETHICAL ISSUES REGARDING ROBOTIC SURGERIES**

The increasing complexity of modern surgical technology willrequire more stringent guidelines for operation and practicesimilar to the discipline exercised in robotics . Main ethical issues 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.

**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**

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