

## Robotic Surgery: The Next Generation Technology

Saini R\*, Giri PA\*\*

Robotic surgery is a new and exciting emerging technology that is taking the surgical profession by storm. Up to this point, however, the race to acquire and incorporate this emerging technology has primarily been driven by the market. In addition, surgical robots have become the entry fee for centers wanting to be known for excellence in minimally invasive surgery despite the current lack of practical applications.[1] Robotic surgery, computer-assisted surgery, and robotically-assisted surgery are terms for technological developments that use robotic systems to aid in surgical procedures. Robotically-assisted surgery was developed to overcome the limitations of minimally-invasive surgery and to enhance the capabilities of surgeons performing open surgery. In the case of robotically-assisted minimally-invasive surgery, instead of directly moving the instruments, the surgeon uses one of two methods to control the instruments; either a direct telemanipulator or through computer control.

A telemanipulator is a remote manipulator that allows the surgeon to perform the normal movements associated with the surgery whilst the robotic arms carry out those movements using end-effectors and manipulators to perform the actual surgery on the patient. In computer-controlled systems the surgeon uses a computer to control the robotic arms and its end-effectors, though these systems can also still use telemanipulators for their input. One advantage of using the computerized method is that the surgeon does not have to be present, but can be anywhere in the world, leading to the possibility for remote surgery.[2] The most widely used clinical robotic surgical system includes a camera arm and mechanical arms with surgical instruments attached to them. The surgeon controls the arms while seated at a computer console near the operating table. The console gives the surgeon a high-definition, magnified, 3-D view of the surgical site. The surgeon leads other team members who assist during the operation.

Three major advances aided by surgical robots have been remote surgery, minimally invasive surgery, and unmanned surgery. Major potential advantages of robotic surgery are precision and miniaturization. Further advantages are articulation beyond normal manipulation and three-dimensional magnification. Some surgical robots are

autonomous, and they are not always under the control of a surgeon. They are only sometimes used as tools to extend the surgical skills of a trained surgeon. A wide range of procedures are now performed by means of robot-assisted surgery. Some of these procedures were already being performed laparoscopically before robots were introduced; the introduction of robotic technology affects expenditures associated with such procedures primarily by increasing the cost per procedure. For procedures that were more often performed as open surgeries, the introduction of robots may affect both the cost and the volume of surgeries performed.

There are several disadvantages to these systems. First of all, robotic surgery is a new technology and its uses and efficacy have not yet been well established. To date, mostly studies of feasibility have been conducted, and almost no long-term follow up studies have been performed. Another disadvantage of these systems is their cost. Another disadvantage is the size of these systems. Both systems have relatively large footprints and relatively cumbersome robotic arms.[3] One of the potential disadvantages identified is a lack of compatible instruments and equipment. Lack of certain instruments increases reliance on tableside assistants to perform part of the surgery.[4] Although in its infancy, robotic assisted surgery appears to offer distinct advantages by providing an interface by which complex laparoscopic procedures can be performed. The salient question dictating its future success is its true economic viability. If industry continues to follow Moore's law (the doubling of computer power and halving of price every 2 years), it seems highly probable that robotic-assisted surgery will be commonplace in the near future.[5] The next generation technology soon be a reality in both the developed and developing world.

### References

1. Lanfranco AR, Castellanos AE, Desai JP, Meyers WC. Robotic Surgery: A Current Perspective. *Annals of Surgery* 2004;239(1):14-21.
2. [http://en.wikipedia.org/wiki/Robot-assisted\\_surgery](http://en.wikipedia.org/wiki/Robot-assisted_surgery). Accessed on 13/05/2015
3. Satava RM, Bowersox JC, Mack M, et al. Robotic surgery: state of the art and future trends. *Contemp Surg*; 2001;57:489-99.
4. Kim VB, Chapman WH, Albrecht RJ, et al. Early experience with telemanipulative robot-assisted laparoscopic cholecystectomy using Da Vinci. *Surg Laparosc Endosc Percutan Tech* 2002;12:34-40.
5. Moore G. Cramming more components onto integrated circuits. *Electronics* 1965;38:114-7.

\* Associate Professor, Dept. of Periodontology, RDC, Loni

\*\* Associate Professor, Dept. of Community Medicine, Rural Medical College of PIMS-DU, Loni, Maharashtra (India)

#### Corresponding author:

Dr. Rajiv Saini, Dept. of Periodontology,

Rural Dental College of Pravara Institute of Medical Sciences, Loni

Email:- [drperiodontist@yahoo.co.in](mailto:drperiodontist@yahoo.co.in)