Technology seems to be an integral part of modern living and we live in exciting times and pace of change in medical and surgical technology has never been more rapid. As we embrace new technology and incorporate it into practice, traditional approaches will metamorphose into seemingly strange but incredibly useful paradigms. One such extraordinary transformation has been the incorporation of robot into the surgical practice, especially in urology. Urologists have over the years embraced new technological advances for patient benefit. On some occasions, however, the initial enthusiasm in something new has failed to endure rigorous scientific scrutiny.

The word ‘robot’ is derived from Czechoslovakian term robota, meaning force work. The word ‘robot’ was originally coined by Karel Capel in his play, Rossum's universal robots in 1921.

The first truly robotic flexible arm, known as the programmable universal Manipulation Arm (PUMA), was developed in 1978, by Victor Scheinman and quickly became the industry standard. The first surgical application of this technology was in 1985 when the PUMA 560 was used to orientate a needle for a radiologically guided brain biopsy. Soon after robots were utilized in other surgeries including PROBOT, to perform trans urethral resection of prostate and the ROBODOC, for use in hip replacement.

The contemporary generation of surgical robot consists of “master-slave” system made by Intuitive Surgical Inc. (Sunnyval,CA).

The da Vinci is an advanced master-slave robotic system which involves control of three to four robotic arms by a surgeon sitting at a remote console. The basic component of the system is (a) a surgeon console (b) a surgical robot with three or four arms (c) an endoscopic stack. The console contains the master tool manipulators, the visual supply and foot pedals for camera and tool manipulation. The surgeon’s hands are inserted in the free moving finger controls (masters). These controls convert the movements of the surgeons’ finger tips and wrist into electrical signals. These signals are translated to computer commands that direct robot to replicate the movements with the robotic instruments in the operative field. The console is connected to the video and the surgical component of the robot via cables. The patient side surgical robot has an arm to control the camera and two or three arms to hold the operating instruments. These instruments are articulated at the wrist and have seven degrees of freedom and two degrees of axial rotation. The master-slave robotic system overcomes many of the limitations of the conventional laparoscopy. It provides the surgeons with 3D 10x magnified vision, wristed instrumentation, tremor filtration, and motion scaling. The system produces an immersive telerobotic environment ideally suited for surgical precision and reconstructive applications. To mention a few major robotic urosurgical undertakings are Robotic Assisted Radical Prostatectomy, Robotic assisted radical cystectomy, Robotic Pyeloplasty, Robotic Assisted Laparoscopic Partial Nephrectomy, and Robotic Sacral Colpopexy.

While in 1998, clinical robotic was introduced to the world of adult surgery, pediatric surgeons of Europe and USA introduced robotic in the field of pediatric surgery mainly in fundoplication and pyeloplasty, since then increasing number of surgeons have reported the success of new techniques in growing range of pediatric surgical subspecialties, namely cervical and trans oral, thoracic, cardiovascular, gastrointestinal and urological.

There are many systems with enormous clinical potential in the pipeline that are likely to be further refined and developed in the coming years before being released into the clinical arena.

Urologists have been quick to embrace robotic surgery and other new technologies and Robotic Assisted Radical Prostatectomy (RALRP) is easily the most common of robotic procedures performed worldwide.

**Direction of Robotic Surgery**

The da Vinci S™ is far lighter than the standard da Vinci system, but it remains a bulky piece of equipment that is difficult to maneuver and store in many standard operating theaters. Groups are looking at reducing these issues by installing ceiling mounted robotic devices.

Nanotechnology or nano tech is the emerging technology in every field and the robots are not exempt.

Nano robots are expected to permit significant new
capabilities for the diagnosis and treatment of diseases, for patient monitoring, and for minimally invasive surgeries.

Recent studies have revealed that the lack of tactile sensation during robot aided surgery can lead to an increase in tissue trauma and misjudgment leading to incomplete surgical resection. Therefore, a number of research institutes aim at equipping surgical robots with sensors and feedback mechanisms to reestablish the surgeons with tactile perception and feedback11-12.

The ability to accurately place a needle into the target area of deep seated organs for various medical purposes like percutaneous nephrolithotomy, radioactive seed placement in prostate brachytherapy, cryotherapy and radiofrequency ablation have been highly facilitated by robotic assistance. Percutaneous access to the kidney robot (PAXY) was used first at John Hopkins University for PCNL patients13.

**Future of Robotic Surgery**

The da Vinci robotics is highly unlikely to represent the ultimate robotic surgical system as a result of the stepwise progression of robotic developments. The devices are expected to be smaller, lighter, and integrated into tele surgical system.

The future robotic developments include the snake like or serpentine robots, which are now being targeted toward the field of natural orifice surgery, NOTES™ (Natural orifice trans luminal endoscopic surgery), and these robots have multiple degrees of freedom14 such devices include Cardio ARM, Laparo ARM, Gastro ARM, and Arthro ARM which will provide various platforms for various single port endoscopic and laparoscopic procedures. These devices open door for incision or external woundless/ scar less surgery and procedures including cholecystectomies, appendicectomies, tubal ligations etc.

The field of surgical robotics continues to move in rapid pace and many of these concepts that we find difficult to grasp at present will rapidly become standard surgical practice throughout the globe.

**REFERENCES:**