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RESEARCH ARTICLE

ROBOTIC SURGERY : EMPOWERING TODAY'S SURGEON FOR BETTER TREATMENT, BETTER OUTCOMES

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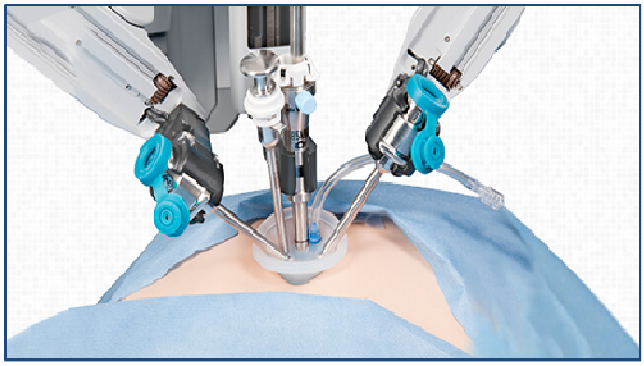
ABSTRACT

Robotic surgery is one of the advanced technology using in the medical field to ease the complicated procedures through computer control by using robotic systems. Robotically-assisted surgery was developed to try to overcome the limitations of pre-existing minimally-invasive surgical procedures and to enhance the capabilities of surgeons performing open surgery. Robotic surgery became successful in almost all the branches like Urology, Gynaecology, Cardiology, Gastroenterology, Oncology and Hepatology. Using robotic surgery, surgeons can perform delicate and complex procedures that may have been difficult or impossible with other methods. Now a days the medical robots have revolutionized the speed and efficiency of health care services in several parts of the world.

Introduction

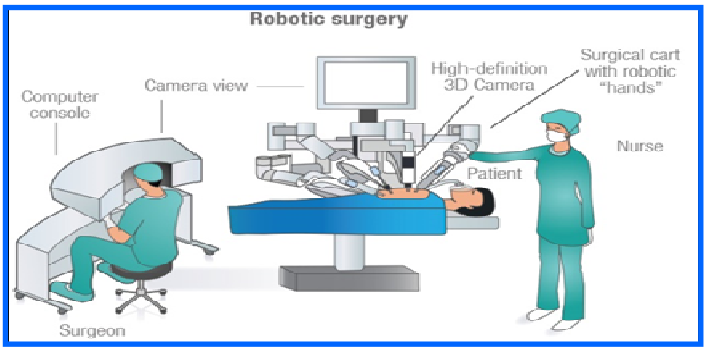
Robotic surgery is the latest evolution of minimally invasive surgical procedures. During surgery, three or four robotic arms are inserted into the patient through small incisions. One arm is a camera, two act as the surgeon's hands and a fourth arm may be used to move obstructions out of the way.

The medical robot performs the surgery using very small tools attached to a robotic arm and the surgeon controls the robotic arm with a computer. The surgeon sits at a computer station and directs the movements of a robot by which small surgical tools are attached to the robot's arms.



The surgeon uses a 3-D image in the surgical field, hands are placed in special devices that directs the instruments. Robotic arms filter out any tremors of the physician's hands & increases the range of motion.

The successful surgery patients have therefore reported smaller incisions, less blood, pain, trauma and a faster healing time than regular surgery. The robots have become popular in the speed and efficiency of health care services in several parts of the

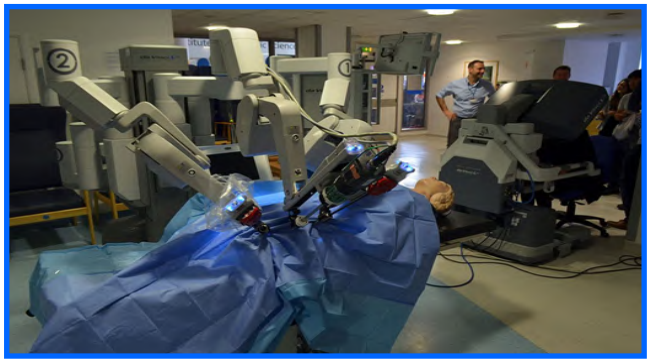


world.

What is da Vinci Surgical System ?

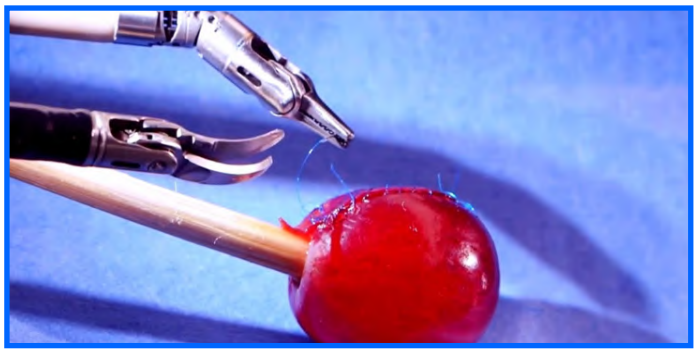
According to the manufacturer, the da Vinci system is so called because the Leonardo da Vinci's "study of human anatomy eventually led to the design of the first known robot in history". Robotic surgery with the da Vinci Surgical System was approved in 2000. It is designed to facilitate the complex surgery using a minimally invasive approach which is controlled by the surgeon from a console.

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



da Vinci patient-side component (left) and surgeon console (right)

the surgical site. The surgeon leads other team members who assist during the operation.

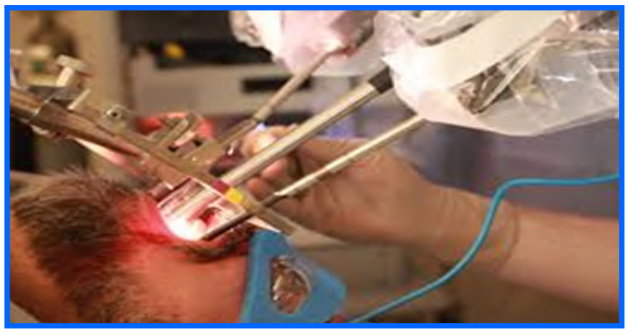


Excellence of Robotic Surgery :
da Vinci stitches a peeled grape back together

VARIOUS ROBOTIC SURGERIES

Trans Oral Robotic Surgery (TORS)

This is a type of minimally invasive surgery, specifically designed for patients with head and neck cancer. Here, the surgeon controls the robotic instruments that have been inserted through the mouth. No incisions are needed. In contrast, traditional open surgery requires long incisions through the throat and jaw, which often leave patients with visible scars, difficulty breathing or swallowing, and a lengthy re-



covery.

Trans Oral Robotic Surgery may be used to treat:

- Throat cancer
- Tongue cancer
- Tonsil cancer

Patient benefits include:

- Precise removal of cancerous tissue
- Significantly reduced pain

Gynaecology

- Multiple Fibroids
- Uterine and Cervical Cancer
- Uterine and Vaginal Prolapse
- Endometriosis
- Vesico-Vaginal Fistula
- Ovarian Cyst

Cardiology

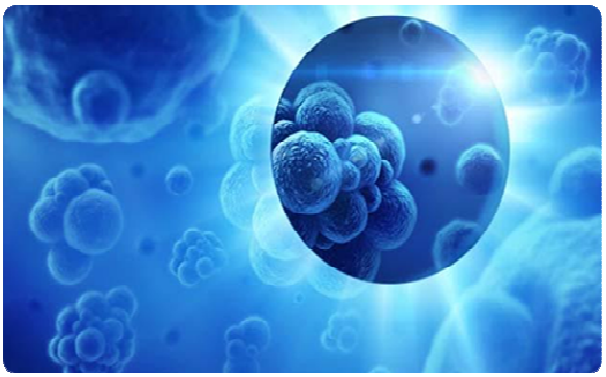
- Atrial Septal Defects
- Mitral and Aortic Valve Disease
- Coronary Artery Disease

Gastroenterology and Hepatology

- Liver Disease
- Colon and Rectal Cancer
- Obesity & Metabolic Disorders
- Gastric Cancer
- Oesophageal disorders

ROBOTIC CANCER SURGERY

A diagnosis of cancer could hit one hard. That is why it is important to learn the facts about the condition and the best available options for treatment before choosing the way ahead. Laparoscopic surgery has been established as a feasible, safe and sound option for certain cancers including colon, endometrial, cervical and oesophageal cancer but has limitations imposed by the 2-dimensional image, instruments

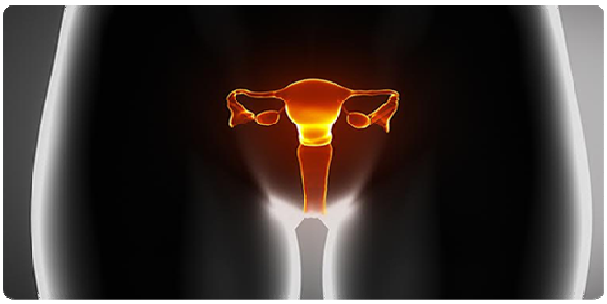


with limited range of motion and dependence on a trained assistant for holding the camera.

ROBOTIC SURGERY IN GYNECOLOGY

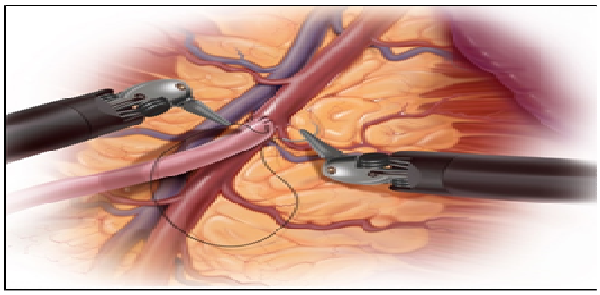
The introduction of da Vinci robotic surgery to the field of gynaecologic surgery has made minimally invasive procedures a possibility for a growing number of patients for whom open surgery was once the only option.

Indeed, conventional laparoscopy has been beneficial when compared to open surgery with advantages such as shorter hospitalization, faster recovery, less blood loss and fewer complications.



Some Gynaecological surgeries that are performed using Robotic technology are:

- **Hysterectomy,** an operation to remove the uterus.
- **Myomectomy,** a surgical procedure to remove uterine fibroids.
- **Sacrocolpopexy,** a surgery to correct Pelvic prolapse, a condition that occurs when muscles and ligaments that support the pelvic organs such as the uterus, vagina, cervix, bladder, urethra, or rectum weaken and make these organs slip from their normal position.
- **Radical Hysterectomy,** for cancer of the cervix or endometrium where the surgeon removes the whole uterus, tissue on the sides of the uterus, the cervix, and the top part of the vagina
- **Tubal Anastomosis,** a procedure to restore fertility after a woman has had a tubal ligation.



ROBOT-ASSISTED HEART SURGERY

ROBOTIC UROLOGY

Imagine a small orange placed inside a deep cavity, has to be peeled with one hand. This is the difficulty a surgeon faces when he has to work on the

Now imagine the surgeon's eyes being placed 5 inches from the orange, with instruments as small as pencils mimicking and exceeding the range of motion of the hands and fingers. The task then becomes exceptionally simple. This is the advantage of Robotic Urological surgery over Laparoscopic surgery.

In 2006, India witnessed its first Robotic Assisted Surgery and Robotic Radical Prostatectomy was completed successfully.

Benefits of Robotic Surgery

It brings down post-surgical complications such as infections, smaller incision, provides lesser chances of developing a hernia.

- It reduces blood loss and trauma.
- Yields excellent cosmetic and functional outcomes.
- The advances in technology have made recovery faster.
- The stay in the hospital has been significantly reduced from weeks to days or hours.

Adverse Events in Robotic Surgery:
A Retrospective Study of 14 Years of FDA Data

Abstract:

Background : Use of robotic systems for minimally invasive surgery has rapidly increased during the last decade.

Understanding the causes of adverse events and their impact on patients in robot-assisted surgery will help to improve systems and operational practices to avoid incidents in the future.

Methods

By developing an automated natural language processing tool, we performed a comprehensive Food and Drug Administration) from 2000 to 2013. We determined the number of events reported per procedure and per surgical specialty, the most common types of device malfunctions and their impact on patients, and the potential causes for catastrophic events such as patient injuries and deaths.

Results

During the study period, 144 deaths (1.4% of the 10,624 reports), 1,391 patient injuries (13.1%), and 8,061 device malfunctions (75.9%) were reported. The numbers of injury and death events per procedure have stayed relatively constant (mean = 83.4, 95% confidence interval (CI), 74.2–92.7 per 100,000 procedures) over the years. Surgical specialties for which robots are extensively used, such as gynaecology and urology, had lower numbers of injuries, deaths, and conversions per procedure than more complex surgeries, such as cardiothoracic and head and neck (106.3 vs. 232.9 per 100,000 procedures, Risk Ratio = 2.2, 95% CI, 1.9–2.6).

Hospitals in which the Robotic Surgery is performing in India

1.Apollo Hospital, Chennai, No. 21, Greams Lane, Off. Greams Road, Chennai-6.

2.Kokilaben Dhirubhai Ambani Hospital & Medical Research Institute, Rao Saheb, Achutrao Patwardhan Way, Andheri, Mumbai, Maharashtra 400053.

3.Narayana Hrudayalaya Multispeciality Hospital, Karnataka, Tamil Nadu, & Jharkhand.

What is the role of the nurse in robotic surgery ?

The role of nurses in robotic surgery is dynamic and multifaceted, including numerous responsibilities, such as: assurance of available instruments, team organization and patient safety. Creating a safety culture is the responsibility of each member of the surgical team. The nurse should always be attentive to maintain an adequate and aseptic environment. The use of checklists is recommended in surgical procedures in order to reduce mistakes.

Conclusion

Adoption of advanced techniques in design and operation of robotic surgical systems and enhanced mechanisms for adverse event reporting may reduce these preventable incidents in the future.

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