Robot Assisted Surgery

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Robots have been used in surgical procedures for several years, but they tended to be used for imaging, including acquisition and integration, or for the positioning of lighting and scopes. Newer technologies allow for greater benefits by minimizing the invasiveness of procedures, leading to less pain, trauma, and scarring, as well as lower cost, faster recovery time, and the ability to complete procedures more quickly and with better precision.

Robot assisted surgery uses a robot to physically perform surgical procedures as a slave to the master commands of a surgeon. The procedure does not involve the robot making autonomous decisions or performing without human input. Many systems utilize a computer as an intermediary between the surgeon's commands and the robot's actions, to process and refine the commands, allowing for better control.

The da Vinci Surgical System, developed by Intuitive Surgical, Inc., of Mountain View, California, consists of a surgeon's console, a patient side-cart, specialized surgical instruments, and image processing devices. At the console the surgeon views a 3D image of the surgical field, and manipulates the master controls. The side-cart includes the two robotic arms, which operate the instruments, and one endoscope. The endoscope is 12mm wide, with two separate 5mm telescopes, providing full focusing and three-dimensional rendering.

The two surgical arms and the endoscope of the da Vinci robot are inserted through small holes in the patient, each about 1cm in diameter. The surgical area is distended with carbon dioxide for easier viewing and to allow for improved maneuverability of the instruments. The da Vinci Surgical System has been used for numerous procedures, including cardiac, urological, and gynecological surgeries, and is available for use at many of the major hospitals, clinics, and universities in the United States, Japan, and Europe.

Robot Assisted MicroSurgery (RAMS) is a system that was jointly developed by NASA, the Jet Propulsion Laboratory, and MicroDexterity Systems, Inc., between 1994 and 1997. The workstation is a six degree of freedom master-slave telemanipulator with referenced manual force and textural feedback. The primary purpose of RAMS is to allow more precise control of surgical instruments by filtering hand tremors, artificially improving the surgeon's manual dexterity.

In the future, integration with high-speed telecommunication systems will allow surgical procedures to be performed from a remote location. The United States federal government urged Intuitive Surgical, Inc., to develop the da Vinci Surgical System, hoping for a way to allow military surgeons to complete surgical procedures without being near the front lines. Currently, these technologies are not fully realized, and FDA regulations require the surgeon to physically be in the same room as the patient.

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