

# UP-TO-DATE ON ROBOTIC SURGERY (OPEN, ARTHROSCOPIC AND MICROSURGERY)

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## INVITED LECTURE

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Robotic surgery is now routine in many surgical specialties. The concept of tele-robotic manipulation was developed during the creation of the International Space Station for, seeking to perform surgical procedures over long distances such as near space. This application was inadequate due to the difficulty of transmitting data at a sufficient speed to perform a safe procedure at such a great distance. But the system showed secondary benefits for use in everyday medical practice that went beyond the simple ability to operate on a patient from a distance.

Robotic surgery is the use of a electromechanical robot controlled by a surgeon at a distance using a telemanipulator. The system commercially known and most widespread is the Da Vinci robot (Intuitive Surgical, Sunnyvale, CA, USA), composed of three components: the control console, the patient side cart, and the central processing unit. The surgeon controls the patient side cart by manipulating two hand operated control mechanisms, viewing the surgical field through a screen conveying high definition 3D images from an endoscope. The patient side cart has 3 robotic arms and an optical system with 3D HD camera, all of which are manipulated by the surgeon from the console. The console and side cart are connected by the processing unit. The robotic system allows the surgeon to control surgical instruments attached to robotic arms with the same freedom of three-dimensional movements as the hand and wrist of the surgeon, but on a small-

er scale. Thus the surgeries performed in small cavities can be performed with great precision and control. This resulted in widespread use of robots in urologic video-assisted surgery, where the use of the robot provided a great technical improvement. Other benefits of using the robot are greater precision of surgical movements and tremor filtering. We also found an ergonomic benefit to the surgeon, because the surgeon operates in a seated position, with arms resting on the surgeons console support. In addition, the possibility of magnified vision with HD 3D quality provides great potential application in microsurgical procedures.

The use of robot in microsurgery has been gaining momentum for about three years, and gradually more distinct procedures are being performed using this system. Reconstructions of peripheral nerves, organ transplants, free flaps, nerve decompressions, micro-vascular anastomoses in several different clinical scenarios are examples. In any microsurgical procedure, because of the advantages mentioned above, it seems logical to simply substitution the surgical microscope with the robot, maintaining the conventional open surgical approach. However, with the possibility to perform precise movements with the robotic instruments in very small spaces, new endoscopic techniques for traditional microsurgical procedures have been developed, such as the possibility of endoscopic exploration and repair of the brachial plexus using the robot.

All of these new uses and techniques were developed from the existing system (Da Vinci) that was not originally developed for this purpose, but for laparoscopic general surgery, thus the potential emergence of new robotic systems devoted to other specific uses may enhance many new indications. New applications in orthopedic surgery are now envisioned, and the future use of the robot in arthroscopic surgery may be considered as the next

boundary, depending only on the development of instruments suitable for this. Concluding, robotic surgery should be considered by all surgeons in many different fields of medicine as a great tool to expand human surgical capacity, not only amplifying the vision, skill and precision of the surgeon's hands, but opening a new horizon of unexplored possibilities.