Introduction to Telesurgery

Sajeesh Kumar

1.1 Introduction to Telemedicine

Telemedicine is a method, by which patients can be examined, investigated, monitored, and treated, with the patient and the doctor located in different places. *Tele* is the Greek word meaning “distance,” and *mederi* is the Latin word meaning “to heal.” Though initially considered “futuristic” and “experimental,” telemedicine is today a reality and is here to stay. In telemedicine one transfers the expertise, not the patient. Hospitals of the future will draw patients from all over the world without geographical limitations. High-quality medical services can be brought to the patient rather than transporting the patient to distant and expensive tertiary care centers. A major goal of telemedicine is to eliminate unnecessary traveling of patients and their escorts. Data acquisition, storage, transfer, processing, and display represent the basis of telemedicine. Telemedicine is becoming an integral part of health-care services in several countries.

1.2 What Is Telesurgery?

Telesurgery, also called remote surgery, is performed by a surgeon at a site remote from the patient. Surgical tasks are directly performed by a robotic system controlled by the surgeon at the remote site. The word “telesurgery” is derived from the Greek words *tele*, meaning “far off,” and *cheirourgia*, meaning “working by hand.”

Telesurgery is surgery – actual cutting and suturing – performed by a surgeon at a console remote from the patient. Advanced communications technology allows the surgeon to manipulate endoscopic cameras and surgical robots to perform the surgery, while being remote from the operating room. Both the remote surgeon and the surgical team with the patient have exactly the same view of the surgical site.
Equipment is required at both the local and remote locations, and a secure communications connection is essential. As a safeguard, a surgical team is available to carry on surgery at the patient’s end.

In the early 2000s, several projects investigating the possibility and practicality of telesurgery were successful in performing complete surgical procedures on human patients from remote locations.

1.3 Does the Robot Actually Perform the Surgery?

Robots take surgery one step further. Typically, the surgeon sits at a console or workstation a short distance away from the patient. The workstation is capable of real-time three-dimensional (3D) imaging, enabling the surgeon to view the operative site inside the body, in detail.

Using hand and/or voice controls at the workstation, the surgeon manipulates robotic arms at the bedside, which are capable of wielding custom-designed surgical instruments and endoscopes (tiny cameras).

Complex software translates the surgeon’s hand movements into tiny, precise, tremor-free actions. The result is a surgery so precise that it cannot be replicated by the human hand.

1.4 Telementoring and Telestration

Telementoring uses advanced communications technology to enable an expert surgeon at a remote location to mentor a second surgeon in an operating room anywhere in the world. The expert surgeon can control the field of view (move the camera arm) from set-up and port placement, including telestration, through the entire procedure.

Telestration is an illustrative technique that allows a remote surgeon to use a drawing tablet to make marks on the local surgeon’s video monitor. Both the remote surgeon and the surgeon with the patient have exactly the same view of the surgical site. The remote surgeon can draw on the tablet to show where to make an incision or can highlight a tumor mass, for example.