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ROBOTIC SURGERY: A BREAKTHROUGH IN MODERN SURGICAL TECHNIQUES

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Medical professionals have been able to turn surgery into a routine treatment in recent decades thanks to scientific and technological advances, overcoming surgical complications and controlling conditions. These developments in surgery have led to the reduction of patients' pain and discomfort, the control of surgical complications, and the facilitation of surgery. The evolution and developments in this field have come in recent decades from open surgery to endoscopic or (Minimally Invasive Surgery) MIS in which a few small incisions are made on the patient's body through video surveillance. The surgeon can perform surgeries that require more incisions in the usual way and result in more complications. Obviously, despite the advantages, this method also has some problems, some of which include eye and hand surgeon dissonance, indirect and two-dimensional vision, limited degree of tool freedom and surgeon fatigue. To solve these problems, the robotic surgical technique was developed.

Introduction. For a long time, surgery was known as a treatment for some diseases, but it was performed in very limited cases because of the severe complications. Along with advances in medical science, surgical treatment has also undergone many developments, with the development and application of effective techniques for pain management, bleeding control and infection prevention, which are the three major surgical complications of treatment. In the medical field, it has become a mainstream treatment, and today many complex surgeries such as organ transplantation are successfully performed. Despite the many advances in surgery that have led surgeons to be able to apply the surgical blade easily wherever needed, there appears to be still room for further development of surgical procedures. According to the basic principle of surgical science that "the greater the incision, the greater the surgical complications and the longer the recovery time," the surgeons' attention is now focused on the ability to manipulate the patient's organs with minimal incisions. These ideas led to the invention of the endoscopic or minimally invasive surgery (MIS) method in 1987 by Dr. Philippe Moore. Laparoscopic surgery and the transformation it has made in surgery is so important that it is referred to as a revolution in the field of surgery. MIS, if performed properly and thoroughly, is both beneficial to the patient in the goals and method and is preferred over open surgery.

Main part. Given the specific features of robotic surgery, this method has significant benefits for the patient and surgeon, including reducing pain and injury, reducing bleeding and blood infusion, reducing postoperative discomfort and complications, reducing the risk of infection, shortening hospital stay, faster recovery. Surgeon's scarring and fatigue reduction are due to surgery. One of the most important issues in surgery that causes many surgical complications is incision length. In the MIRS procedure, a few small incisions can be complicated, such as cardiac surgery, which typically requires a 30 cm incision in open surgery. It seems that the benefits of this system in microsurgery are the manipulation of narrow and remote spaces. Another major advantage of this method is the ease of suturing in reconstructive surgeries such as biliary system, proximal gastro-jejunostomy, pyloreventral syndrome and vaginal closure. The position and orientation of the robot provides an ergonomic environment for the surgeon to assist the surgeon and provide direct access to the operating area. Another advantage of the MIRS technique is that it is not available in laparoscopic surgery. Robotic technology is the most advanced minimally invasive surgery that is in its infancy. With this method, laparoscopic problem interventions become easier, safer and less fatiguing for the surgeon. Of course, there is still some uncertainty about its clinical indications. Although clinical studies have shown the advantage of robotic surgery compared to classical laparoscopy, more objective evidence

is needed. One of the disadvantages of different robotic surgery systems is the lack of perception of touch and stretch for the surgeon. Existence of this touch feedback helps the surgeon to make an accurate assessment of the elements present on the scene and to judge correctly. Of course, with the use of animated training devices and 3D visualization, the surgeon can enhance the understanding of the sensations and tensile strength of the robot arm and balance these forces. The second disadvantage of these systems is their very high costs, although there is hope that with the expansion of their market and the common use of these devices in operating rooms, costs will be reduced. The third disadvantage of robotic surgery is the large size of the surgical machine that medical engineers should pay attention to. With measures such as reducing the size of devices or installing robot arms to the operating room roof, it is expected that the devices will occupy less space around the patient. In addition to other advancements in these systems, new design of the devices with the gyratory motions, computer-aided placement (endoscopic incisions) can facilitate surgical operations.

Conclusions. Minimally invasive robotic surgery systems have recently enhanced the surgeon's manual and visual acuity in endoscopic surgery. Surgery, especially in confined and delicate spaces, is easier with computer-manipulated telephony and three-dimensional vision and its complications are less than open endoscopic surgery. In other words, robotic surgery is a turning point in surgical techniques. This approach has clearly introduced new tools into the field of minimally invasive surgery and expanded its technical capabilities and medical indications. Of course, the economic problems and other disadvantages of this method, such as the lack of touch feedback, are large dimensions of the issues that are important for the development of its applications and require the attention of biotechnologists.

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