

## ROBOTIC SURGERY - IN WORLD MEDICINE

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**Abstract.** *This scientific article describes the development of robotic surgery, which is an achievement of world medicine, its role in modern medicine, its advantages, areas of application, and possibilities.*

**Keywords:** *medical technologies, robotic surgery, teleoperation, robotic surgery technology, robotic surgeon.*

### INTRODUCTION

Humanity is getting great achievements in every field of science in the age of technology that is progressing year by year. In particular, great success is being achieved in the fields of medicine - biomedical engineering, medical robotics, nanotechnology, and artificial intelligence, and it continues consistently. In this regard, robotic surgery (surgery with the help of a robot) is one of the great achievements of world medicine. Robotic surgery is highly recognized by the world community and this is due to its many advantages.

### LITERATURE ANALYSIS AND METHODOLOGY

Robotic surgery (surgery with the help of a robot) is the implementation of complex surgical procedures with the use of robots during the surgery with small incisions. Robotic surgery technology is able to determine the anatomical structure of the patient's organs and the layer-by-layer structure of tissues during the surgical procedure through high-level mathematical modeling, without requiring the patient to undergo a computer tomography examination before the surgery. This surgical technology differs from traditional surgical methods in that it performs complex surgical methods through small incisions with high accuracy. The development of robotic surgery is connected with the integration of the field of robotics with medicine and the establishment of companies producing robots focused on medical purposes. An example of this is the production of robotic surgical systems "AESOP", "ZEUS", "Da Vinci" and their involvement in the surgical process. Among them, "AESOP" - a robotic surgical system was produced in 1990 by Computer Motion, Goleta CA, USA, and in 1994 became the first robotic surgeon approved by the Food and Drug Administration as a surgical aid. Below a model of this robotic surgery complex is presented:



Figure 1. Robotic surgeon model AESOP

Such robot-surgeon models of "AESOP" as 1000, 2000, 3000 have been created, and its latest models have the ability to receive voice commands from the surgeon.

One such robotic surgery system is the "ZEUS" model, which was developed by the Computer Motion company (USA) and consists of 3 robotic arms. One of the hands controls the laparoscope, and the other two control the surgical instruments. For information, it is worth mentioning that with this "ZEUS" robotic surgical system, in 1997 in Cleveland, USA, a successful fallopian tube reconnection surgery was performed, and in 1998, in Leipzig, Germany, heart surgery was successfully performed by ensuring the blood recirculation from the other side.

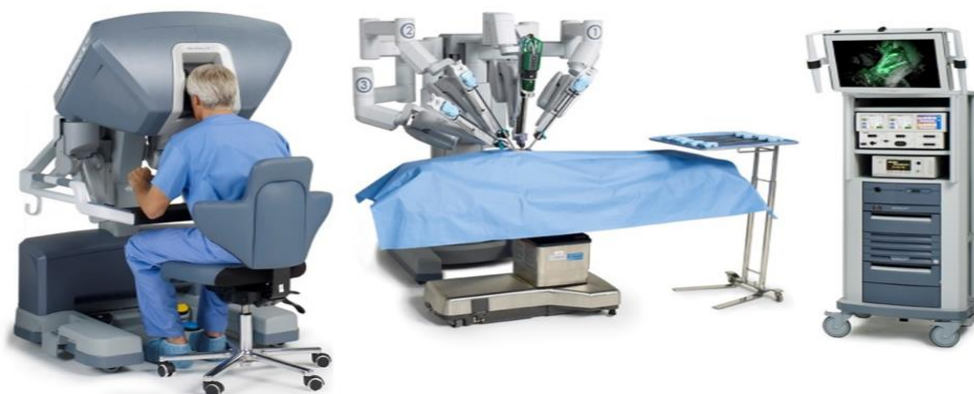


**Figure 2. Robotic surgeon model ZEUS**

The Da Vinci surgical robot, developed by Intuitive Surgical, Sunnydale, CA, became the first operative robot for general laparoscopic procedures approved by the US Food and Drug Administration in 2000. It consists of two main objects - a surgeon's console and four robot-surgeon arms. One of the arms places an endoscopic camera with two lenses on the patient's body, and the other three are adapted to control surgical instruments. Da Vinci robotic surgery complex includes the following:

- console for the surgeon
- robotic surgeon's hands
- surgical instruments
- high-resolution 3D endoscope
- a display that shows an image

In the process of surgery, the surgeon manages the whole process while sitting at the console. A robot-surgeon works within a system by sensing the surgeon's hand movements.



**Figure 3. Robotic surgeon model Da Vinci**

## **RESULTS AND DISCUSSION**

Robotic surgery differs from traditional surgical methods by combining several advantages. Including:

- Surgical instruments are small in size and can rotate and move in a much wider range than a human hand.

- the robot-surgeon works with small incisions, which in turn results in less bleeding and a significant reduction in the risk of blood loss.

- due to the small size of the surgical incisions, the pain is less and heals quickly, which leads to a quick return of the patient to an active life and a shorter stay in the hospital.

- due to less pain and less blood loss during surgery, a significant reduction in the use of blood transfusions and painkillers is achieved.

- the risk of infection is reduced.

- during robotic surgery, the surgeon does not need to be in the operating room, because the robotic surgical system is a telemanipulated system. This makes it possible to easily carry out teleoperation processes and is of great importance in the development of telemedicine.

- hand tremors of the surgeon - which may be present during the operation - are filtered by special programs of the robotic surgeon.

It should be mentioned here that the surgeon does not have to stand up during the entire operation, which prevents the surgeons from getting tired quickly and thus ensures a successful operation.



**Figure 4. Robotic surgery system Da Vinci**

In today's world medicine, the scope of use of robotic surgery in several fields of medicine is developing. The scope of use in the fields including:

- neurosurgery

- cardiosurgery
- gynecological surgery
- urological surgery
- colorectal surgery
- oncological surgery
- orthopedic surgery
- ophthalmology is increasing.

### **CONCLUSION**

From the above, it can be concluded that the extensive development of robotic surgery occupies an important place in the field of telemedicine in world medicine. The integration of medical engineering and robotics industries for one purpose has an important place in the development of robotic surgery. In particular, experts of the medical network of our country emphasize two main factors in the development of robotic surgery technology in the medicine of our Republic:

1- training of mature personnel capable of managing robotic surgery technology and formation of their reserve;

2- increasing the number of robotic surgeons in the medicine of our republic.

In this regard, the establishment of joint educational programs between the fields of medicine and technical (robotics) of higher educational institutions, the formation of a joint personnel base, the production of robotic surgical complexes in technological production branches are of great importance.

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