



APPLICATION OF COMPUTER TECHNOLOGIES IN DIAGNOSIS AND SURGICAL PLANNING IN ABDOMINAL SURGERY

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ABSTRACT

This article examines the role of computer technologies in the diagnosis and surgical planning of abdominal operations. It describes modern methods of computer visualization, navigation systems, and software that improve diagnostic accuracy, reduce the risk of complications, and enhance surgical outcomes. Special attention is given to the integration of computer technologies into surgical practice and the prospects for their further development.

Introduction

Modern abdominal surgery is experiencing a dynamic stage of technological advancement. The introduction of computer technologies has significantly changed the approach to diagnosis, surgical planning, and operative procedures. Innovative visualization methods such as computed tomography (CT), magnetic resonance imaging (MRI), 3D modeling of organs and systems, as well as surgical navigation, enable physicians to make more accurate decisions and minimize intraoperative risks. The aim of this work is to explore the main directions in the use of computer technologies in abdominal surgery and their impact on the quality of surgical treatment

1. The Role of Computer Technologies in Modern Abdominal Surgery

Computer technologies have become an integral part of modern surgery. They allow surgeons to obtain three-dimensional images of organs, assess tissue functionality, and predict possible complications. Computer simulations provide the opportunity to “rehearse” an operation before performing it on a real patient, which is especially important for complex procedures on the liver, pancreas, and intestines. The use of digital technologies ensures the integration of data from various diagnostic methods into a single system, improving treatment efficiency.

2. The Use of Computer Technologies in Disease Diagnosis

Various computer technologies are used in the diagnosis of abdominal diseases, with computed tomography (CT) and magnetic resonance imaging (MRI) playing a leading role. These methods provide high-precision cross-sectional images of abdominal organs. With the development of artificial intelligence, automatic image interpretation has become possible, reducing the risk of diagnostic errors. Additionally, machine learning technologies are

increasingly used to analyze large datasets and help doctors identify pathological changes more quickly.

The combination of ultrasound diagnostics with computer-based image analysis systems also plays an important role. Software tools make it possible to perform 3D reconstruction of organs and vessels, assess blood flow, and determine the size of tumors or inflammatory lesions.

3. The Use of Computer Systems in Surgical Planning and Operations

Surgical planning with the use of computer technologies has become standard practice in many clinics. 3D organ models based on CT and MRI data allow the surgeon to determine the optimal approach, calculate the resection volume, and minimize the invasiveness of the procedure. Virtual and augmented reality systems provide preoperative training and simulations that improve surgical skills. During operations, navigation systems display the real-time position of surgical instruments relative to the patient's anatomical structures. This is particularly important in laparoscopic and robot-assisted surgeries, where precision is crucial.

One of the most significant achievements is the use of robotic systems such as Da Vinci. These systems provide high-precision movements, reduce invasiveness, and shorten the patient's rehabilitation period. Moreover, computer technologies enable remote surgeries (teleoperations), opening new opportunities in the field of surgery.

Conclusion

The use of computer technologies in diagnosis and surgical planning in abdominal surgery represents one of the key directions in modern medicine. The application of CT, MRI, 3D modeling, navigation, and robotic systems improves diagnostic accuracy, shortens operation times, and reduces the risk of complications. The future of surgery is inseparably linked to digital innovations, which make medical care safer, more efficient, and personalized.

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