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MODERN COMPUTER TECHNOLOGIES IN ADOLESCENT CARDIAC SURGERY: A STEP INTO THE FUTURE

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Abstract
Modern medicine is experiencing rapid development, with one of the most significant and innovative fields being cardiac surgery. Cardiovascular diseases, especially congenital heart defects (CHD), pose a serious threat to the adolescent population, requiring high-precision diagnostics and timely surgical intervention. In recent years, the extensive implementation of computer technologies in cardiac surgery has led to significant improvements in treatment efficiency. The use of artificial intelligence, 3D visualization, robotic surgical systems, and the Internet of Things (IoT) not only enhances diagnostic accuracy but also minimizes the invasiveness of procedures, making surgeries less traumatic and safer.
The purpose of this study is to examine key technological advancements in adolescent cardiac surgery, analyze their impact on clinical practice, and explore prospects for further development in this field.

Keywords: Cardiac surgery, adolescents, computer technology, competitive systems, 3D visualization, artificial intelligence.

INTRODUCTION

Main Body

The Importance of Cardiac Surgery and Modern Challenges

Cardiac surgery is a high-tech medical field aimed at correcting cardiovascular system pathologies that require surgical intervention. In adolescence, the most common conditions requiring surgery are congenital heart defects and acquired cardiac pathologies. Despite significant advancements in diagnostics and treatment, cardiac surgery remains a complex discipline where surgical precision and risk minimization are crucial. This is where modern computer technologies play an invaluable role by providing innovative solutions for diagnostics, surgical planning, and postoperative monitoring.

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Artificial Intelligence (AI) in Diagnostics and Treatment

AI analyzes vast amounts of data, including medical imaging, test results, and patient history, allowing physicians to identify pathologies with high accuracy. It predicts possible complications, optimizes surgical planning, and reduces the likelihood of medical errors, significantly improving surgical success rates.

3D and 4D Visualization in Surgical Planning

Advanced three-dimensional modeling technologies enable surgeons to visualize the anatomical features of a patient's heart in advance, simplifying surgical preparation. 4D visualization, in turn, allows for the analysis of not only a static heart image but also its real-time dynamics, which is critical in complex heart defects.

Robotic Surgery: A New Level of Precision

The use of robotic surgical systems, such as Da Vinci, allows for highly precise operations while minimizing surgical invasiveness. This contributes to shorter rehabilitation periods, reduced postoperative complications, and improved patient quality of life.

Internet of Things (IoT) and Remote Patient Monitoring

Pacemakers and implantable defibrillators equipped with IoT technologies enable medical professionals to monitor a patient’s condition in real time and respond promptly to any abnormalities. Such systems are particularly relevant for adolescents with chronic heart diseases requiring continuous medical supervision.

Augmented and Virtual Reality in Training and Surgery

Virtual (VR) and augmented reality (AR) are increasingly used to train surgeons for complex operations. These technologies allow doctors to simulate various scenarios, enhancing precision and confidence during actual surgical procedures.

Conclusion

The integration of modern computer technologies into adolescent cardiac surgery is opening new horizons in diagnostics, treatment, and patient rehabilitation. Innovative approaches such as artificial intelligence, 3D visualization, robotic surgical systems, and the Internet of Things are improving surgical accuracy, reducing procedure invasiveness, and enhancing the overall quality of medical care.

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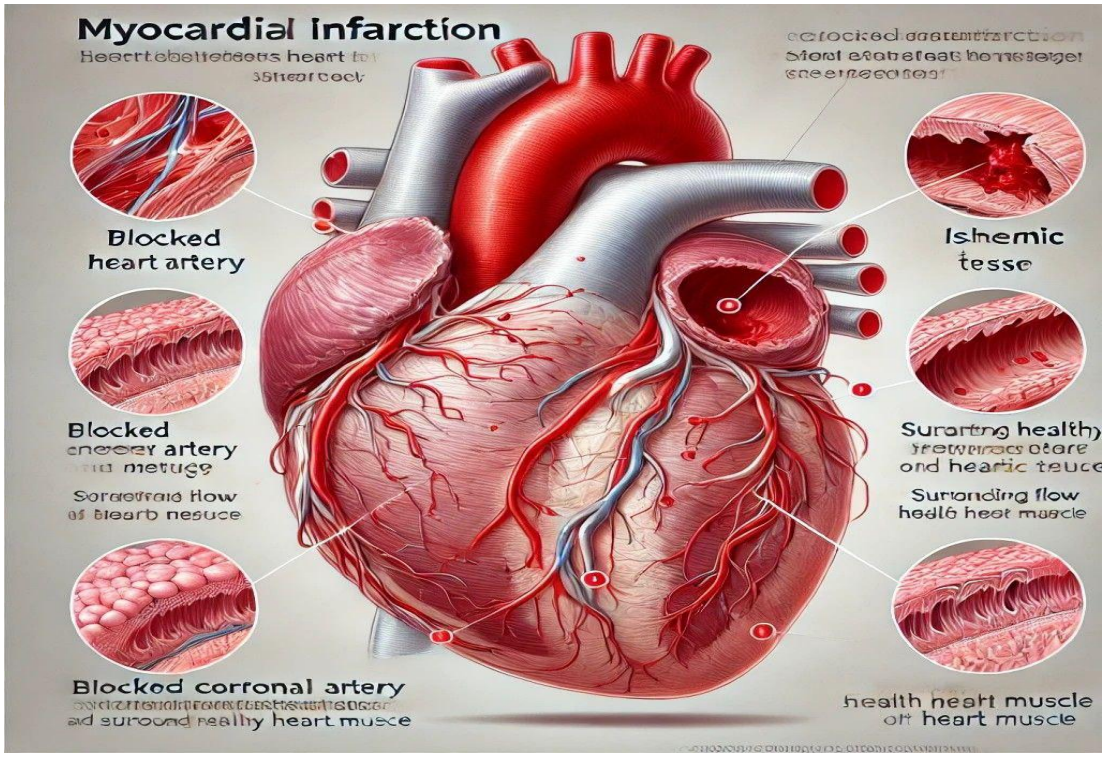

In the future, further development and integration of digital technologies are expected to enhance treatment efficiency and improve patients' quality of life. However, despite these advantages, it is essential to consider critical aspects such as technology accessibility, cost, and the need for additional medical training. Only a harmonious combination of scientific advancements, medical practice, and technological progress will allow for optimal outcomes in cardiac surgery and ensure a high level of adolescent health in the future.

REFERENCES

1. Kadirova Munira Rasulovna, Yigitalieva Nozimakhon Farkhodjon qizi., Simulation technologies as a modern method of teaching english to medical students in a higher education institution. Society and innovations. 2024
2. M.I.Bazarbayev, A.K.Tulaboyev, E.Ya.Ermetov, D.I.Sayfullayeva, Toshkent Davlat Stomatologiya Instituti kitobi: https://library.tsdi.uz › booksPDFTIBBIYOTDA AXBOROT TEXNOLOGIYALARI https://www.google.com/url?q=https://library.tsdi.uz/storage/books/March2022/FJSmtLWXw7D1NnQ7qxeV.pdf&sa=U&ved=2ahUKEwin3bPz6emDAxXNKxAIHU6LAVEQFnoECA4QAQ&usg=AOvVaw1n1POciUG-e7lRf4Q6XFbc
3. Wikipedia : Wikipediahttps://uz.m.wikipedia.org › wikiSog‘liqni saqlashdagi sun’iy intellekthttps://www.google.com/url?q=https://uz.m.wikipedia.org/wiki/Sog%25CA%25BBliqni_saqlashdagi_sun%25CA%25BCiy_intellekt&sa=U&ved=2ahUKEwiOjsCu6mDAxU9JxAIHQuFDyoQFnoECA0QAQ&usg=AOvVaw3l0EoZe69q5sP-zBqNyOFy
4. FJSTI biofizika kafedrasi : https://fjsti.uz/departments/38/biofizika-va-axborot-texnologiyalarkafedrasi

5. You tube lessons: https://youtu.be/gQ6Ios_ktCM?si=pLcvIbOzWBN9Ongu
6. https://youtu.be/rwGeOzkWTs4?si=GN4ybiMiR2UMMmJC
7. Biology book pages:8-10,192-193’’:
8. Page 58: Test-Uz.ruhttps://www.test-uz.ru › bookBiologiya 10 sinf darslik
9. Атаханов, С. (2023). РОЛЬ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИИ В ЛЕЧЕНИИ ОНКОЛОГИЧЕСКИХ ЗАБОЛЕВАНИЙ. Евразийский журнал академических исследований, 3(4 Part 2), 87-89.
10. Atakhanov, S., & Turdimatova, R. (2023). TECHNOLOGY OF CRITICAL THINKING OF STUDENTS ON BIOLOGICAL ISSUES. Academia Repository, 4(12), 121-127.
11. Sanjarbek, A. (2023). The role of information technology in the treatment of cancer. Asian Journal Of Multidimensional Research, 12(4), 32-34

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