NEXT-GENERATION TECHNOLOGICAL APPLICATIONS IN ORTHOPAEDIC SURGERY

EGE ISLATINCE

Dr., Salisbury District Hospital, Salisbury UK
E-mail: egeislatince@gmail.com

Abstract - In today's globalized and increasingly integrated world, the field of orthopaedic surgery — one of the key specialties within the surgical sciences — has been undergoing significant technology-driven transformations. The aim of this presentation is to explore the role of rapidly evolving innovations such as robotic systems, artificial intelligence (AI) integration, and 3D navigation in modern orthopaedic surgery. It seeks to highlight their clinical applications, advantages, and current limitations while offering an outlook on how these technologies may lead to safer, more effective, and personalized surgical approaches in the future. At present, robotic systems, AI, and 3D navigation techniques are reshaping clinical practice by improving surgical precision, reducing recovery times, and enhancing patient satisfaction. In particular, robotic-assisted orthopaedic surgery platforms have become an emerging trend across various subspecialties such as joint replacement, spinal stabilization, and traumatic fracture repair. The growing adoption of these systems has contributed to increased anatomical accuracy, reduced intraoperative errors, and shorter hospital stays. Furthermore, the integration of AI is expanding the capabilities of surgical robotics through real-time image processing, adaptive surgical path planning, and intelligent feedback mechanisms. For instance, several orthopaedic robotic systems now incorporate semi-automated functions, trajectory-tracking navigation, and patient-specific cutting strategies. Despite these remarkable improvements, several barriers continue to limit widespread adoption — including high costs, steep surgical learning curves, complex system integration, and limited long-term clinical data. Nevertheless, these technologies clearly represent the future of orthopaedic surgery, offering procedures that are less invasive, more patient-specific, and safer. In conclusion, next-generation technological applications in orthopaedic surgery have the potential to transform both clinical practice and patient outcomes. However, successful integration requires strong multidisciplinary collaboration and participatory training models to ensure sustainable and effective implementation.

Keywords - Robotic-Assisted Surgery, Orthopaedic Robotics, Artificial Intelligence, 3D Navigation, Surgical Precision, Cost-Effectiveness.