The Role of Artificial Intelligence-Mediated Robotics in Robotic-Assisted Minimally Invasive Surgery

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INTRODUCTION

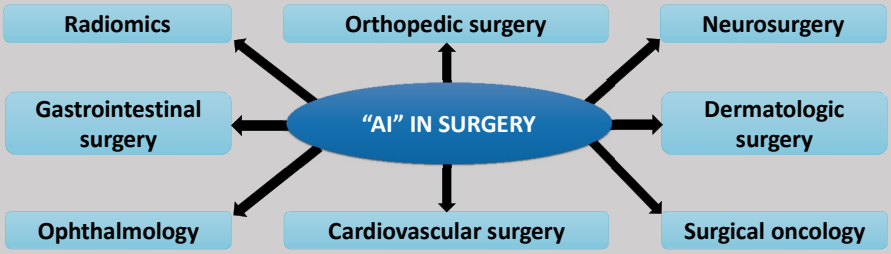
Artificial intelligence has revolutionized the technology looking for more precision and accurate methods. AI mediated Minimally invasive surgery is an emerging trend in diagnostic and surgical techniques.

OBJECTIVES

- This groundbreaking review delves into the transformative integration of Artificial Intelligence (AI) in Robotic-Assisted Minimally Invasive Surgery (RMIS), aiming to redefine the landscape of surgical innovation.
- Unlike conventional literature reviews, this study adopts a distinctive focus, accentuating the symbiosis between AI and RMIS, particularly emphasizing surgical advancements, diagnostic precision, and patient management.

MATERIAL & METHODS

- We did a comprehensive literature review using Pubmed, Scopus, Google scholar & Cochrane databases.
- Keywords: "Artificial intelligence", "Robotic assisted surgery", "Minimally invasive surgery", "Diagnostic techniques".
- We reviewed cross-sectional studies, clinical and controlled trials, pharmacological studies, and review articles.
- The search included publications and articles in the English language only.
- The reference list of relevant and recent primary articles, book chapters, reviews, and alternatives were also reviewed to consider studies that may have been missed.



RESULTS (NARRATIVE REVIEW)

★ Types of AI

- Type – 1 (Narrow, General, Super)
- Type – 2 (Reactive machines, Limited memory machines, Theory of mind, Self-awareness)

★ RMIS

- Reduced unnecessary trauma
- Quicker recovery
- Lower chances of complications
- More detailed diagnosis
- Minimum error
- More Precision & accuracy (RAMIE)

★ Diagnostic Techniques

- Accurate imaging
- Real time decision support
- Earlier diagnosis
- GestroNet & MobileNet-V2 models
- CNN & DCNN (ENGOANGEL)

★ Challenges

- Technical challenges & limitations
- Regulatory & legal implications
- Privacy & data security concerns
- Ethical & safety considerations
- Trust between man & robots

★ Recommendations

- Tele-surgery
- Enhancing technical standards
- Addressing privacy & security concerns
- Regulatory oversight
- Ethical training for surgeons
- Transparency in algorithms
- Patient centered approach

★ Real-World Examples

- The da Vinci Surgical System
- BrainLab Cranial Navigation System
- Materialise Mimics
- Surgical Site Infection Detection System
- The Smart Tissue Autonomous Robot (STAR)

CONCLUSION

- AI has demonstrated its ability to enhance precision surgeries and innovate diagnostic techniques, thereby paving the way for future advancements in healthcare.
- However, to ensure responsible AI integration challenges such as privacy concerns and ethical considerations need to be addressed.
- Recommendations outlined in this paper aim to enhance technical standards, ensure privacy, and promote a patient-centered approach.

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