

The Rise of Artificial Intelligence in Plastic and Aesthetic Surgery

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DOI: <https://doi.org/10.36347/sjmcr.2025.v13i11.054>

| Received: 20.09.2025 | Accepted: 24.11.2025 | Published: 26.11.2025

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Abstract

Review Article

Artificial intelligence (AI) is rapidly transforming plastic and aesthetic surgery, offering significant improvements in the planning, execution, and postoperative follow-up of procedures. Thanks to advanced algorithms, surgeons can now rely on 3D modeling to simulate surgical outcomes, while AI-assisted robotic systems enable more precise maneuvers. AI also personalizes care by analyzing individual patient data, particularly in anti-aging treatments, and facilitates postoperative monitoring through remote follow-up. However, these developments raise ethical concerns, notably regarding privacy and the potential dehumanization of care, requiring careful and regulated use of these technologies.

Keywords: Algorithm, Plastic Surgery, Artificial Intelligence, Technology.

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I. INTRODUCTION

Artificial intelligence is a tool used by machines capable of reproducing human-like behaviors such as reasoning, planning, and creativity.

The fields of application of AI are vast and difficult to define, as they extend to many aspects of everyday life: online searches and shopping, targeted advertising, automated translation, personal digital assistants, smart cities, as well as transportation and healthcare.

AI is emerging today as a revolution in the medical field, and plastic and aesthetic surgery is no exception. Long centered on manual techniques and surgeons' visual expertise, the specialty has experienced new approaches thanks to advances in AI. These innovations are transforming not only how procedures are performed but also how patients are managed and how outcomes are anticipated. [1]

AI in Morocco is rapidly developing, marked by promising initiatives and challenges to address. Several actions have been undertaken to integrate AI into various sectors:

Institutional initiatives:

The International Center for Artificial Intelligence of Morocco, known as AI Movement, was inaugurated at Mohammed VI Polytechnic University

(UM6P). Its aim is to position Morocco as a regional hub for AI by supporting research, training, and innovation.

International commitments:

Morocco has adopted UNESCO recommendations for ethical and responsible use of AI, demonstrating its willingness to align with international standards. [2]

However, several challenges remain, including the absence of a regulatory framework, limited access to data, and a lack of specialized expertise. Nevertheless, the prospects are promising: AI could boost economic growth and transform key sectors such as healthcare. To maximize these opportunities, a clear national strategy including regulation and training is essential. [3]

II. AI in Surgical Planning

One of the most visible contributions of AI in plastic surgery lies in preoperative planning. With machine learning algorithms, surgeons can now use precise 3D modeling to simulate the results of various aesthetic procedures, such as rhinoplasty or breast augmentation. These models—based on each patient's specific morphological data—allow outcomes to be anticipated with unprecedented accuracy. [4]

Tools such as CrisaliX (Fig. 1) use augmented reality to provide patients with a simulation of their postoperative appearance. [5] AI analyzes thousands of similar cases to refine modeling and reduce

discrepancies between simulations and real outcomes, increasing patient trust and assisting surgeons in planning their surgical approach.



Fig. 1: Crisalix Technology [5]

III. Operative Precision and AI-Assisted Robotics

Intelligent robotic systems are increasingly present in operating rooms, offering unmatched precision. Systems such as da Vinci (Fig. 2) are already

used for complex procedures, and the integration of AI algorithms further optimizes these tools. [6] In aesthetic surgery, this translates into more precise maneuvers, smaller incisions, and reduced scarring.



Fig. 2: Da Vinci Robot [6]

AI also assists surgeons by analyzing instrument movements in real time and automatically adjusting parameters to prevent errors. These devices enhance surgical safety while reducing postoperative complications. [7–8]

IV. Personalized Care Through Data Analysis

Another promising area of AI is personalized care. By analyzing massive datasets—including medical history, biological characteristics, and even aesthetic preferences—AI can create tailored surgical plans. Each patient becomes unique in the eyes of the algorithm, which integrates complex variables that even the most experienced surgeons may struggle to consider. [9]

For example, algorithms can determine the most suitable surgical technique based on skin quality, bone structure, and genetic factors, going far beyond standardized approaches to deliver truly individualized outcomes.

V. Advances in Rejuvenation Techniques

In anti-aging and non-invasive procedures, AI supports more targeted and effective rejuvenation techniques. AI-assisted image analysis helps practitioners identify areas requiring treatment while optimizing doses of injectable agents such as botulinum toxin or hyaluronic acid.

AI-powered tools, such as skin scanners (Fig. 3), analyze facial features to detect wrinkles, pigmentation, or loss of elasticity. These data help

aesthetic surgeons design personalized treatment plans that meet each patient's specific needs. [10]



Fig. 3: Visia Skin Scanner [10]

VI. Postoperative Monitoring and Remote Follow-Up

AI technology continues to play a role after surgery. Through mobile applications using artificial intelligence, patients can send postoperative photos and data to their surgeon, who analyzes them remotely. These systems detect early signs of complications and allow timely adjustments to care. [11–12]

Algorithms compare postoperative images with expected outcomes and flag anomalies requiring intervention. This continuous monitoring enhances long-term results and reduces the need for in-person visits, offering patients greater peace of mind.

VII. Ethics and Limitations of AI in Aesthetic Surgery

Despite its undeniable benefits, AI also raises ethical issues. One challenge is the risk of dehumanizing care. Patients may hesitate to trust decisions made partly by machines, even when supervised by surgeons. It is essential for AI to remain a tool serving medical expertise, not replacing it.

Additionally, the massive collection of personal data poses concerns about confidentiality. Patients must be informed about how their data are used and protected. Strong regulations are needed to ensure ethical use and prevent misuse. [13–14]

VIII. CONCLUSION

The rise of artificial intelligence in plastic and aesthetic surgery is deeply transforming the field. From surgical planning to personalized care and postoperative monitoring, AI enhances precision, safety, and outcomes. However, despite these promising advances, AI must remain a complement to human expertise, and ethical and relational aspects of patient care must always remain at the forefront.

Conflict of Interest Statement: The authors declare no conflict of interest related to this article.

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