

# Artificial Intelligence in Plastic Surgery

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## ABSTRACT

Artificial intelligence (AI) has been increasingly used as a tool to improve surgical and diagnostic processes. This study addresses the main applications of AI in plastic surgery, as well as its benefits and challenges. AI allows the customization of treatment according to the individual characteristics of the patient, as well as the early detection of complications and the making of more proactive decisions through the analysis of medical images. Furthermore, AI can improve diagnostic and surgical accuracy, reducing the error rate and improving patient outcomes. However, the adoption of AI in plastic surgery also presents challenges, such as the need for constant training of surgeons in using these technologies and concerns about the safety of patient data. Therefore, it is essential for surgeons to be aware of the benefits and limitations of AI and to be able to integrate it into their work responsibly.

**Keywords:** Artificial Intelligence, Plastic Surgery, Personalization, Diagnostic Accuracy, Surgical Precision.

## ABBREVIATIONS

AI: Artificial intelligence.

## INTRODUCTION

Artificial intelligence (AI) is a field of computer science that focuses on developing algorithms and systems that can perform tasks that usually require human intelligence, such as learning, reasoning, decision-making, and pattern recognition [1].

Plastic surgery has been one of the areas of medicine that have most benefited from technological advances in recent years [2]. As a result, AI emerges as one of the most promising technologies with great potential to transform surgical practice [3]. AI is already being applied in several areas of plastic surgery, including surgical planning, image analysis, surgical robotics, and postoperative monitoring [4]. This article aims to explore the current applications of AI in plastic surgery, discussing the advantages and challenges of its implementation, in addition to addressing the future perspectives of this technology. AI has been increasingly used as a tool to improve surgical and diagnostic processes [5].

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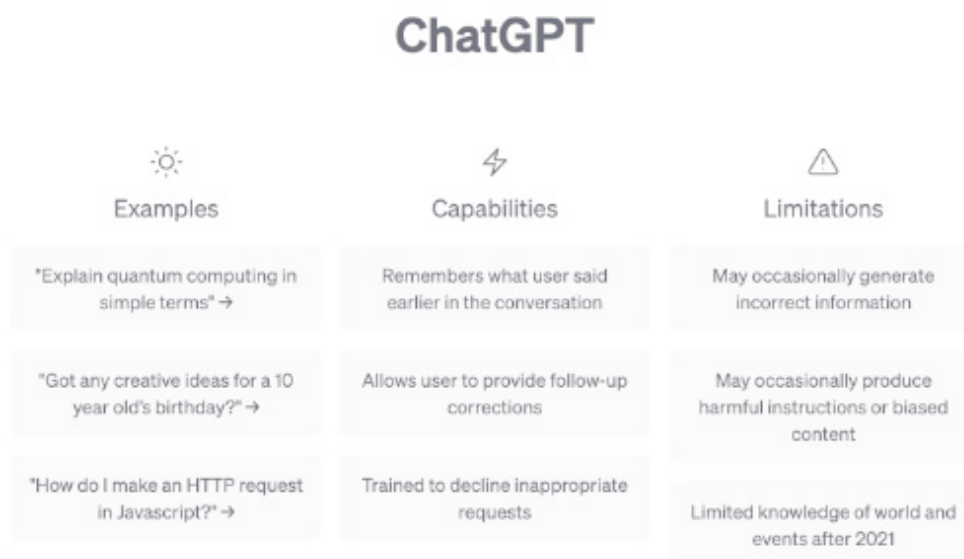
This study aims to discuss the main applications of AI in plastic surgery, as well as its benefits and challenges.

## METHODS

In this study, we sought to explore the use of artificial intelligence (AI) in plastic surgery by asking direct questions to ChatGPT (OpenAI Limited Partnership, San Francisco,

California, USA), an OpenAI-trained language model that has demonstrated a wide range of abilities in natural language processing tasks.

The authors prepared the questions and sent them to ChatGPT, which responded autonomously, providing information based on their prior knowledge and data processing capacity (Figure 1).



**Figure 1.** The Chat GPT interface.

The questions were divided into three main categories:

- 1) Current applications of AI in plastic surgery
- 2) Challenges and limitations of AI in plastic surgery
- 3) Future perspectives of AI in plastic surgery

Chat GPT responses were analyzed by the authors and organized into a manuscript that describes current applications, challenges, and prospects for AI in plastic surgery.

To ensure the quality of the information provided by ChatGPT, only responses consistent with the existing literature and validated by the study authors were selected. In addition, additional research was carried out to complement and validate the information provided by ChatGPT.

This study was conducted as a narrative review of information provided by ChatGPT and did not involve primary data collection or analysis.

## RESULTS

*How to optimize preoperative evaluation in plastic surgery using artificial intelligence?*

There are several ways in which artificial intelligence can be used to optimize preoperative evaluation in plastic surgery, such as:

**Image analysis:** Artificial intelligence can be trained to analyze patient images and identify the most suitable procedures for each case. For example, the algorithm can assess facial symmetry and suggest correcting specific asymmetries.

**Result prediction:** Through image processing, artificial intelligence can simulate how the patient will look after the surgery, allowing the plastic surgeon and the patient to have a more accurate idea of the final result even before the operation.

**Risk identification:** Artificial intelligence can help identify risk factors in patients that may increase the chances of complications during plastic surgery. This can include medical history, preoperative tests, and even genetic data.

**Customization of procedures:** Based on data about the patient, such as age, gender, and medical history, artificial intelligence can suggest more suitable and personalized procedures for each case. This can ensure more satisfying results and reduce the chances of complications.

**Cost reduction:** Using artificial intelligence in preoperative evaluation can help reduce costs, allowing a more accurate and faster evaluation of patients, and avoiding unnecessary exams or consultations.

In summary, artificial intelligence can be a valuable tool to

optimize preoperative evaluation in plastic surgery, allowing surgeons to make more accurate and personalized decisions and reducing the chances of complications.

*In comparing plastic procedures guided by AI and non-guided, is there an improvement in the outcome in such a way as to include some database in medical guidelines as a reference or prerequisite for performing a procedure?*

Including a database as a reference or prerequisite for performing AI-guided plastic procedures in medical guidelines could improve outcomes. A database of successful procedures can provide valuable information such as best practices, optimal surgical techniques, and potential problems to avoid. This can help reduce the risk of complications and improve overall results.

By incorporating this information into medical guidelines, surgeons can benefit from standardized practices, allowing them to make more informed decisions during the surgical process. Additionally, guidelines can promote consistency in using AI-guided procedures, reducing variability in surgical techniques and ensuring that the procedure is performed using the most effective techniques and practices.

However, it is essential to note that medical guidelines should not be viewed as a substitute for the surgeon's experience and clinical judgment. While guidelines can provide valuable information, each patient is unique, and the surgeon must consider individual factors when making decisions about the surgical process.

In general, using a database in medical guidelines for AI-guided plastic procedures can be a helpful tool to improve surgical outcomes. However, it should be used with clinical experience and the surgeon's judgment. In addition, guidelines should be updated regularly to reflect current best practices and ensure the highest level of patient safety and care.

*How does the domestic use of AI to indicate aesthetic procedures in plastic surgery affect the patient experience?*

The domestic use of AI to indicate aesthetic procedures in plastic surgery can positively and negatively impact the patient experience, depending on how the technology is used. On the one hand, AI can help patients make more informed decisions about the cosmetic procedures they want. AI can provide insight into the potential outcomes and risks associated with a given procedure and help simulate the results so that patients get an idea of the outcome. This can help increase patient satisfaction as they will have a more accurate idea of what to expect from the procedure.

On the other hand, using AI can lead to an over-reliance on technology and a reduction in the interaction between

the patient and the plastic surgeon. This can lead to a less personalized experience and a lack of understanding of the patient's unique needs and concerns. Furthermore, using AI can lead to a lack of personal accountability for the results. The patient may rely too heavily on AI technology and recommendation rather than trusting the plastic surgeon's judgment.

Therefore, AI must be used as a complementary tool to the plastic surgeon's experience and judgment rather than completely replacing them. Patients should be educated about the limits of AI and encouraged to work closely with their plastic surgeons to develop a personalized treatment plan that suits their needs.

*Is it possible to predict long-term aesthetic results using artificial intelligence after plastic surgery?*

Artificial intelligence can be used to help predict long-term aesthetic results after plastic surgery. However, many factors can influence the final result and make prediction more difficult. An example of applying artificial intelligence to predict aesthetic results from plastic surgery is using machine learning techniques to analyze pre-and post-surgery images. Algorithms can identify subtle differences in the proportions, symmetry, and other characteristics of the breasts, face, or body, and help predict how those differences might evolve over time.

However, it is essential to remember that plastic surgery involves a healing and recovery process that can significantly affect the final result. In addition, changes in the body, such as aging and weight gain, can alter the appearance of the treated areas. Therefore, predictions of long-term aesthetic results should only be used as a general guide and cannot guarantee the final result.

Therefore, careful preoperative evaluation and discussions between doctor and patient are essential to establish realistic expectations and ensure safe and satisfactory results.

*How can limits be established for using AI to avoid patient bias and not reduce the credibility of a plastic surgeon when indicating and planning a procedure?*

In order to establish limits to the use of AI in the indication and planning of aesthetic procedures in plastic surgery, it is essential to consider some strategies, such as:

**Combating algorithmic bias:** It is necessary to ensure that the AI algorithms used are developed with data and statistical models that accurately represent the diversities of gender, ethnicity, and other characteristics of patients. This can be done through regular testing and validation of the algorithms.

**Humanize interaction:** the use of AI should not completely

eliminate human interaction in the indication and planning of procedures. Plastic surgeons need to remain involved and participate in the process, considering the patient's medical history and personal experience.

**Focus on education:** It is critical to educate patients and professionals about the responsible use of AI, ensuring they understand the limitations and risks of the technology and how it can be used to improve the patient experience.

**Ensuring transparency:** Patients must know when and how AI is used in their care and be informed about how the technology affects decision-making.

**Ethics and privacy:** patient data must be protected, and privacy must be respected. There must be an ethical commitment to using AI, always respecting medical values and principles.

**Regulation:** Finally, a regulatory framework is needed to ensure AI's responsible and ethical use in plastic surgery. Professional health organizations and government regulatory authorities may establish such regulations.

Plastic surgeons can use AI responsibly and safely by adopting these strategies, avoiding patient bias, and maintaining professional credibility.

*How can artificial intelligence help plastic surgeons in court?*

Artificial intelligence can help the plastic surgeon forensically in many ways, including:

**Medical Records Analysis:** Artificial intelligence can analyze the patient's medical records and help identify whether there was any malpractice or negligence on the part of the plastic surgeon during the surgical procedure.

**Result simulation:** Through image processing, artificial intelligence can simulate how the patient would look after surgery, allowing the plastic surgeon to demonstrate how the result would be and possible adverse results to be considered before the operation.

**Risk identification:** Artificial intelligence can help the plastic surgeon identify risk factors in patients that may increase the chances of complications during plastic surgery. This can reduce the possibility of complications and minimize the risks associated with the procedure.

**Data analysis:** Artificial intelligence can help the plastic surgeon analyze large datasets related to specific surgical procedures, allowing patterns and trends to be identified that may be useful in improving surgical outcomes.

**Improved communication:** Artificial intelligence can help improve communication between the plastic surgeon and the patient through 3D simulations that allow the patient to see the expected result of the surgery, enabling a better

understanding by the patient.

In summary, artificial intelligence can help the plastic surgeon in court by analyzing medical records, simulating results, identifying risks, analyzing data, and improving communication between the surgeon and the patient. This can help minimize risks and complications, as well as improve surgical outcomes.

## DISCUSSION

In plastic surgery, AI has been increasingly used as a valuable tool to improve surgical and diagnostic processes. Responses show that AI can improve the accuracy and effectiveness of surgical procedures, reduce recovery time and minimize the risks of complications. In plastic surgery, AI can be applied in several areas, including:

**Surgical planning:** AI can help surgeons create more accurate and personalized surgery plans for each patient. For example, the technology can be used to simulate the outcome of surgery before it even takes place, allowing surgeons to adjust their planning before the procedure. AI has also proved helpful in identifying risk factors for each patient, allowing for the prediction of possible complications and helping the surgeon prepare even in the preoperative period.

**Image analysis:** AI can be used to analyze patient images, such as photographs and CT scans, to help surgeons identify critical anatomical features and plan surgery more accurately.

**Surgical robotics:** AI can be used in robotic systems to help surgeons perform minimally invasive surgical procedures with greater precision and safety.

**Postoperative Monitoring:** AI can be used to monitor patients after surgery and alert doctors to any signs of complications or infections that may arise.

However, it also presents some challenges, such as the need for constant training of surgeons in using these technologies, as well as concerns about the security of patient data. In addition, AI does not replace the surgeon's technical skill and clinical judgment; it is only a complementary tool. Finally, the adoption of AI in plastic surgery raises critical ethical questions. For example, there are concerns that overreliance on AI could lead to surgeon negligence or inattention to the more humane aspects of patient care. In addition, there may be risks associated with the privacy of patient data, as well as the security and reliability of the AI systems used.

In short, AI has the potential to significantly transform plastic surgery, improving the accuracy and effectiveness of procedures and reducing risks for patients. However, it is essential for plastic surgeons to carefully consider the ethical and legal aspects of using AI in their clinical practice.

## CONCLUSION

AI can help surgeons choose the best surgical procedure, customize treatment according to individual patient characteristics, and assist in the early detection of complications. However, the adoption of AI in plastic surgery also presents challenges, such as the need for constant training of surgeons in using these technologies and concerns about the safety of patient data.

AI can be a valuable tool in plastic surgery, significantly improving treatment precision and personalization. However, it is essential that surgeons continue to improve their technical skills and clinical judgment and that there is close monitoring to ensure the safety and effectiveness of these technologies.

## AUTHOR CONTRIBUTIONS

DSV: Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing–Original Draft Preparation, Writing–Review & Editing, Visualization, Supervision.

TFCA: Investigation, Data Curation, Writing–Original Draft Preparation, Writing–Review & Editing, Visualization.

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LRB: Investigation, Data Curation, Writing–Original Draft Preparation, Writing–Review & Editing, Visualization.

VDL: Investigation, Data Curation, Writing–Original Draft Preparation, Writing–Review & Editing, Visualization.

PBE: Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing–Original Draft Preparation, Writing–Review & Editing, Visualization, Supervision.

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## CONFLICT OF INTEREST

There are no conflicts of interest in this manuscript.

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