
Artificial intelligence in the service of esthetic dentistry



Implant dentistry has undergone a remarkable transformation thanks to the adoption of digital workflows, which have improved accuracy, efficiency, and communication throughout the treatment process.

The widespread acceptance of digital workflows can be attributed to their ability to facilitate the daily work of dental professionals at every stage of the procedure, resulting in a more precise, efficient, and comfortable patient experience. By incorporating advanced technology and streamlining the care process, dentists can provide their patients with the highest level of care^{1,2}. Artificial intelligence (AI) has revolutionized various fields, including dentistry, where it is extensively employed in treatment planning and smile design. Several AI-based smile design concepts are currently available, using machine learning algorithms to recommend an optimal smile design. They take various factors into account, including facial symmetry, lip line, tooth shape and size, and overall facial harmony, to help dentists offer their patients esthetically pleasing and functional treatments. Using AI-based concepts, dentists can achieve better treatment outcomes and enhance patient satisfaction³⁻⁵.

What are the benefits of using smile design software?

Conventional workflows in implant dentistry may be sensitive and operator-dependent and rely heavily on the expertise and experience of the practitioner. However, digital technologies have brought forth many patient-friendly and efficient opportunities, challenging traditional protocols and techniques. For example, digital smile design and treatment planning provide a more straightforward and streamlined approach, reducing dependence on operator skill and expertise while increasing precision and accuracy.

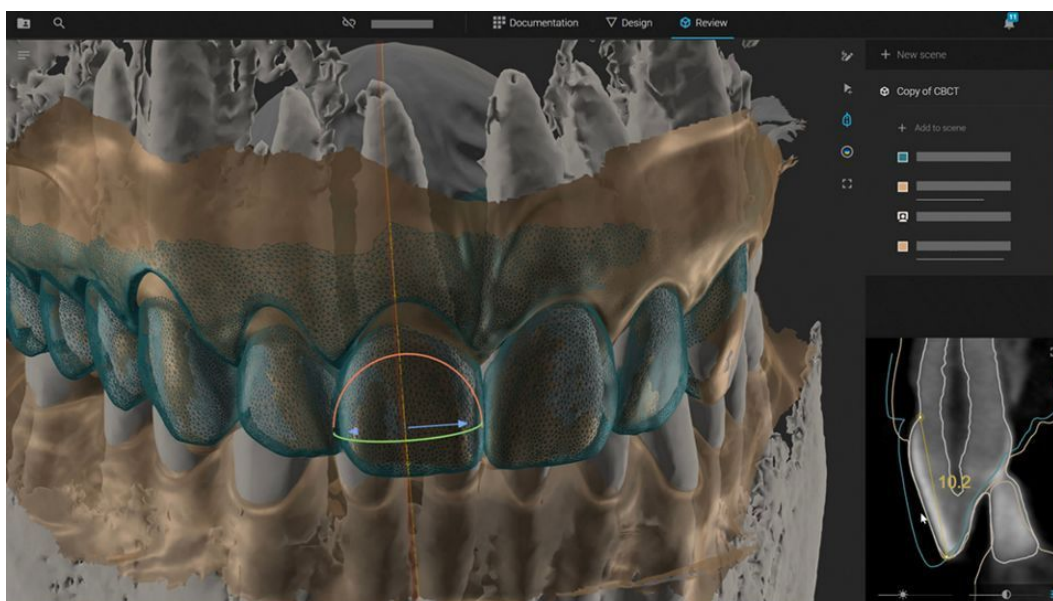
Smile design software can provide various benefits for dentists and patients, including:

1. **Enabling predictable, naturally esthetic smiles:** Smile design software allows dentists to design smiles more efficiently and accurately than traditional methods. The software can quickly analyze a patient's facial features and generate multiple smile designs in minutes⁶.
2. **Accuracy:** Smile design software uses advanced algorithms to analyze a patient's facial features and create a personalized 3D model of their smile. This can result in more accurate and natural-looking smile designs tailored to the patient's unique features⁷.
3. **Enabling patient engagement and case acceptance:** Smile design software can simulate the proposed changes to a patient's teeth, giving the dentist and patient a clear idea of the final result. This can help to manage patient expectations and increase patient satisfaction with the final results⁸.
4. **Empowering efficiency and connection in teamwork:** Smile design software can facilitate better communication between dentists and patients by visually representing the proposed changes. Patients can see what their smile will look like before any dental work is done, and dentists can use this to discuss treatment options and answer any questions the patient may have¹⁰.
5. **Increased patient satisfaction:** By using smile design software to create personalized and natural-looking smile designs, dentists can increase patient satisfaction with the final results⁹.

How does the software work?

Dentists now have access to AI-based smile design software that allows them to create highly personalized and esthetically pleasing smile designs. By leveraging advanced algorithms, the software can analyze the patient's facial features, including lip line, facial symmetry, and tooth shape and size, using a series of photos, intraoral and CBCT scans uploaded into the program to create a virtual patient. With the ability to simulate, customize, and test proposed changes to the patient's dentition, the dentist and patient can clearly understand the final result before moving forward. Once a smile design has been chosen, the software can be used to review all records, communicate with dental team and start

with an end in mind when planning.



Is this planning approach backed up by evidence?

Although the overall scientific evidence for using AI in the planning and execution of digital workflows is scant, the number of scientific publications and clinical reports addressing this treatment concept increases yearly. They confirm that the smile planning approach can be successfully utilized for different treatment modalities with various degrees of clinical complexity. Several clinical reports have already addressed the efficiency of the smile design software-based treatment. In a recent study, Cofar et al. described and illustrated digital treatment planning and interdisciplinary treatment in a highly complex clinical case. The case was planned and solved with the help of an intuitive, AI-powered smile design software called Smilecloud (www.smilecloud.com) that allows for an efficient design of the patient's smile during the treatment planning phase. It features a unique natural shapes search engine that is able to render compositions into virtual realistic smile designs. The authors argue that this technique allows for more natural and anatomically accurate restorations and conclude that "Digital protocols and design tools provide clear clinical roadmaps for increased efficiency, precision, and predictability, vastly improving the quality of interdisciplinary patient care"¹⁰. In another clinical report, the same authors presented the digital alveolar support technique, a treatment concept designed to produce tissue support and natural contouring in anterior implant restorations. In conclusion, Dr. Cofar emphasized that applying digital instead of conventional planning considerably simplified and facilitated the overall treatment planning procedure¹¹. A similar digital smile design planning approach was also successfully implemented by Van Dooren et al. in their clinical report discussing the crown-lengthening concept, a surgical technique used to expose more of the tooth structure for restorative or esthetic purposes. In this article, the authors underlined another advantage of the planning software: effective communication with the patient and the technician¹². Finally, the Smilecloud planning software was also used by Giordani et al. for resolving a very esthetically demanding case, including the correction of a gummy smile in conjunction with immediate implant placement. The authors acknowledged that digital tools have become essential to modern interdisciplinary treatment planning and execution. They can improve treatment outcomes by allowing efficient communication between the patient and the team, and precision in the execution of procedures and intraoperative monitoring¹³. Digital dentistry has significantly enhanced the predictability of oral rehabilitation through virtual planning and smile design selection. AI-based smile design software is an innovative technology transforming how dentists approach smile design, offering promising solutions for highly personalized and precise treatment. By leveraging advanced dental technology and techniques, dental professionals can now deliver high-quality esthetic dental procedures that meet each patient's unique needs and preferences. As technology continues to evolve, it has immense potential to revolutionize cosmetic dentistry and further improve patient outcomes.

Source: [Straumann Group](#)

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