

# Optimizing Clinical and Laboratory Workflows

*Where Analog  
Approaches,  
Digital Technology,  
Photography,  
and Artistry  
Come Together*

**Vincent Fehmer, MDT**  
Editor-in-Chief

**QDT**  
QUINTESSENCE OF DENTAL TECHNOLOGY

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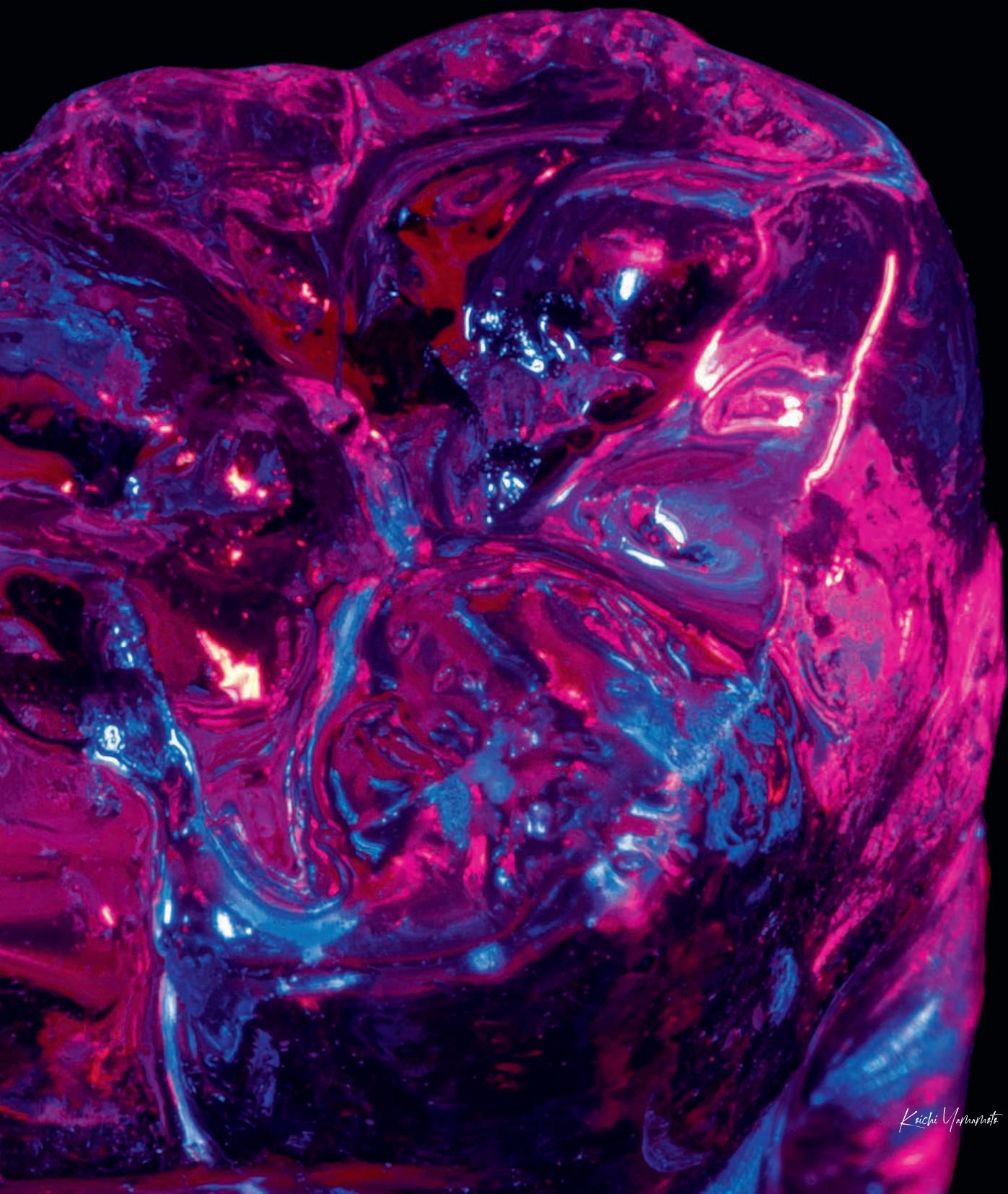
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This year marks an exciting milestone for QDT. For the first time, we are publishing five online manuscripts in addition to the print edition. These interactive digital publications open new possibilities for engagement, allowing colleagues worldwide to experience and learn from our shared work in richer, more dynamic ways. To access each online article, simply scan the QR code on the opening page printed in this volume.

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Koichi Yamamoto



# Editorial: Embracing Innovation for the Future of Dental Care

As we navigate an era defined by rapid technologic advancements, the dental community stands at a transformative moment. With the *Quintessence of Dental Technology* (QDT), our mission has always been to bridge the gap between innovative practices and real-world applications in dentistry. In this edition, we reflect on the transformative power of technology in our field and the profound implications for patient care, education, and professional growth.

The last few years have seen remarkable progress in dental technology, from the integration of digital dentistry to the rise of telehealth solutions. These advancements not only enhance our diagnostic and treatment capabilities but also elevate the patient experience, making care more efficient and accessible. As we embrace these tools, we must also recognize the responsibility that comes with them. Continuous education and adaptation are essential, ensuring that we leverage these technologies effectively and ethically.

Collaboration within our community has never been more crucial. The sharing of knowledge and experiences among dental professionals encourages an environment of growth and innovation. Through our publications, we aim to create a platform where ideas can flourish and where practitioners can stay informed about the latest research, techniques, and materials. Your contributions are invaluable in this ongoing dialogue, and we encourage you to share your insights and experiences with us.

Moreover, as we look ahead, it's vital to consider the holistic impact of our technologic advancements. How do they influence patient outcomes, and how can we use these tools to promote preventive care? The future of dentistry is not just about adopting new technologies; it's about enhancing the relationship between patient and provider.

As we present the latest research and insights in this issue, I invite you to reflect on how you can integrate these advancements into your practice. Let us embrace the challenges and opportunities that lie ahead with open minds and a commitment to excellence.

Thank you for your continued support of QDT. Together we can shape the future of dental technology and ultimately improve the lives of our patients.

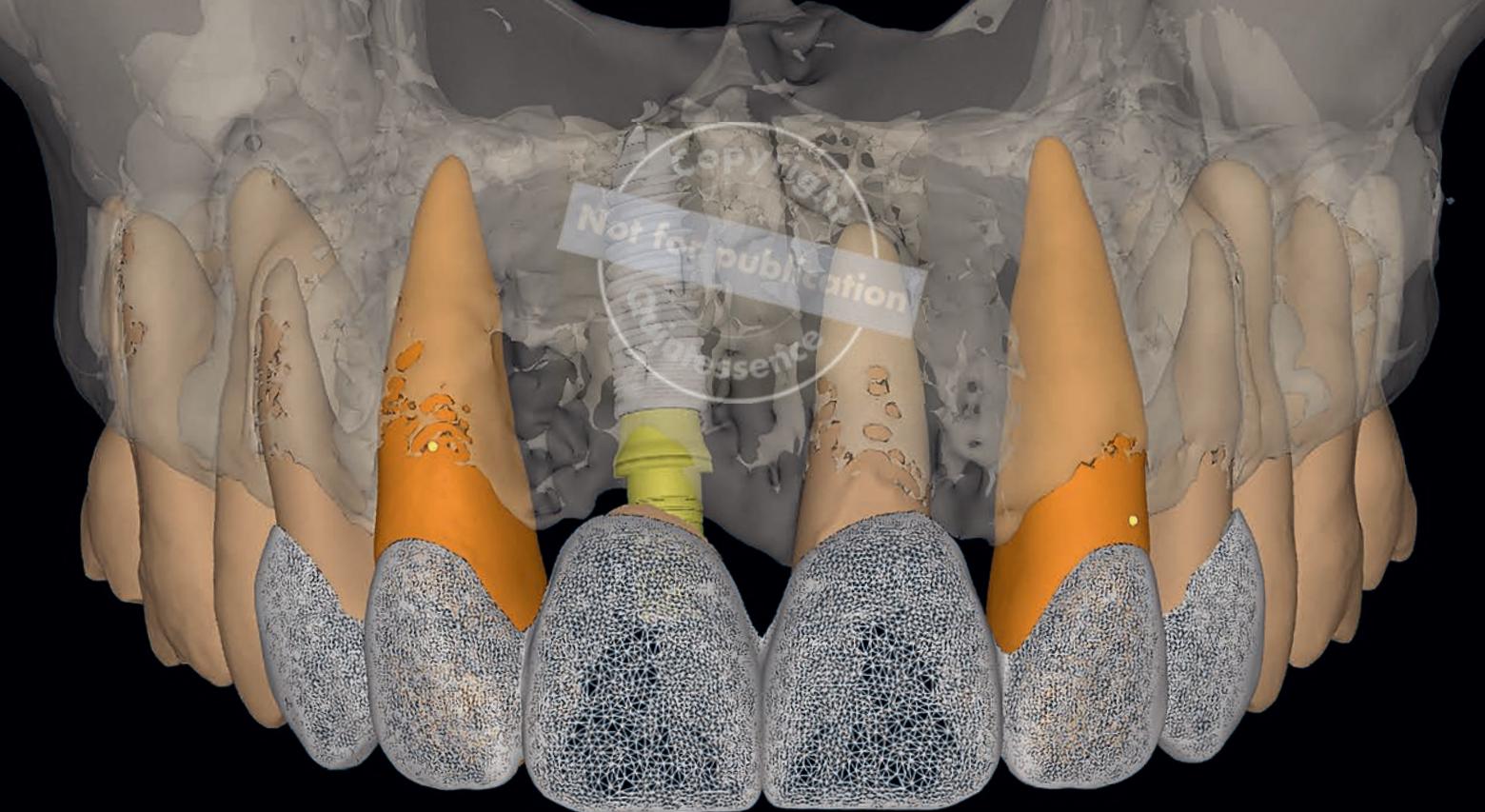
Warm regards,





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# Designing Clinical Excellence in the Digital Era: Surgery and Prosthetics Guided by Design

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**I**n today's dental practice, we increasingly encounter complex cases that demand a multidisciplinary approach—merging perio-implantology, prosthodontics, esthetic planning, and more. These treatments often involve a series of seemingly small steps, each carrying significant weight for the final outcome.

In the past, with limited structured protocols, we relied heavily on expert intuition and accumulated clinical experience to navigate such cases. But the landscape has changed. We now practice in a digital era, where technology allows us to move from reactive decision-making to proactive, design-driven care. The digital avatar of the patient—the virtual twin—enables us to previsualize and simulate a final design that is both biologically feasible and esthetically integrated. This design becomes more than a plan; it becomes the central guide for every clinical move, allowing us to align surgical and prosthetic procedures with precision and predictability. With this shift, we are not only improving outcomes but also delivering them with greater speed, consistency, and confidence.

To illustrate our protocol—and specifically how the final design serves as the cornerstone for our clinical workflow—we present in this article a complex case that embodies both surgical and esthetic challenges. This case exemplifies the value of an interdisciplinary approach, where each step, from diagnosis to final restoration, is meticulously aligned with a digitally created treatment plan. By following the virtual design as a blueprint, we can demonstrate how modern tools enable us to overcome clinical complexity with clarity, control, and predictability.

## Patient Presentation

The patient presented with a complex maxillary anterior situation, primarily characterized by the absence of the maxillary right central incisor due to previous trauma (Figs 1 to 4). The adjacent central incisor showed signs

of minor external root resorption distally (Fig 5); however, percussion testing revealed no symptoms of ankylosis, allowing us to preserve it at this stage.

Esthetic and periodontal challenges were significant. Both the remaining central incisor and the maxillary right canine exhibited pronounced gingival recessions, with the canine presenting a particularly deep recession accompanied by a cleft defect. This combination severely compromised the soft tissue architecture and overall esthetic harmony. The region was further complicated by extensive scar tissue and disorganized soft tissue anatomy—consequences of secondary healing after the initial trauma and previous interventions. In addition, aged composite restorations were present in the area, contributing to an overall disharmonious appearance and making the case particularly demanding from both a surgical and prosthetic perspective (Figs 6 and 7).

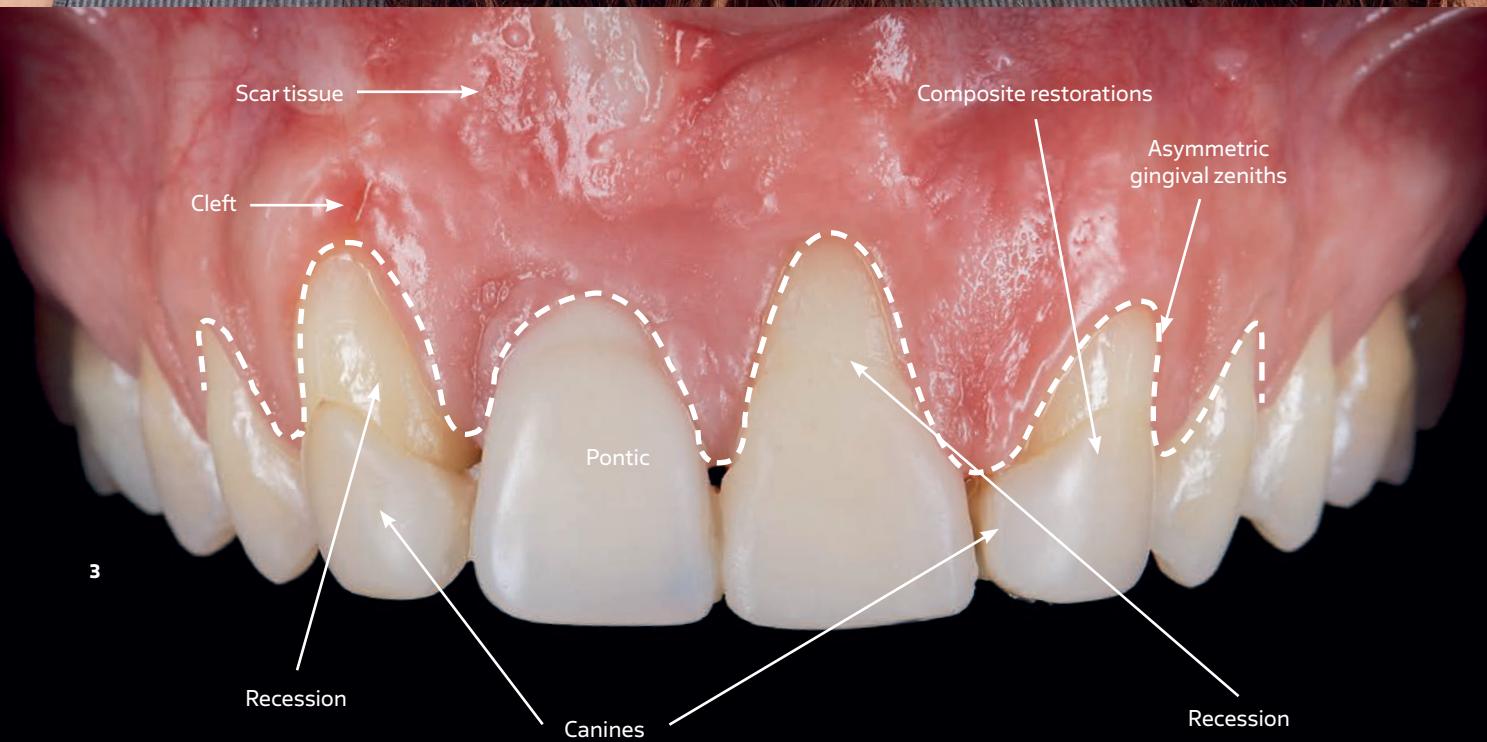
Critically, the gingival margins were asymmetric—an especially important factor in this case, as the patient displayed a high smile line (gingival smile), making even minor discrepancies highly visible. Restoring the esthetic balance and biologic harmony of the soft tissue, while managing the surgical and prosthetic complexity, was therefore essential for the success of this treatment.

Prosthetic challenges in this case stemmed primarily from the anatomical discrepancy caused by the presence of canines in the position of congenitally missing lateral incisors (see Fig 4). Canines, by nature, have more voluminous crowns and bulkier roots compared to lateral incisors, both in shape and proportion. This anatomical difference poses a significant esthetic hurdle, as it disrupts the natural symmetry and balance of the anterior dentition. Achieving a harmonious smile would require careful modification and camouflaging of the canines—through contouring, restorative reshaping, and potentially soft tissue manipulation—in order to mimic the appearance of natural lateral incisors.



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## Digital Design: Integrating Esthetics, Biology, and Function

The first step is the digital design, which forms the foundation of the entire treatment. Esthetically, it is aligned with the patient's facial features to ensure a natural and balanced smile. Biologically, the design must be realistic and surgically achievable, respecting soft tissue limitations and healing dynamics. Functionally, it ensures proper occlusion, interarch relationships, and phonetics. This integrated plan guides every clinical step toward a predictable and harmonious outcome.

### Design workflow: From 2D to 3D integration

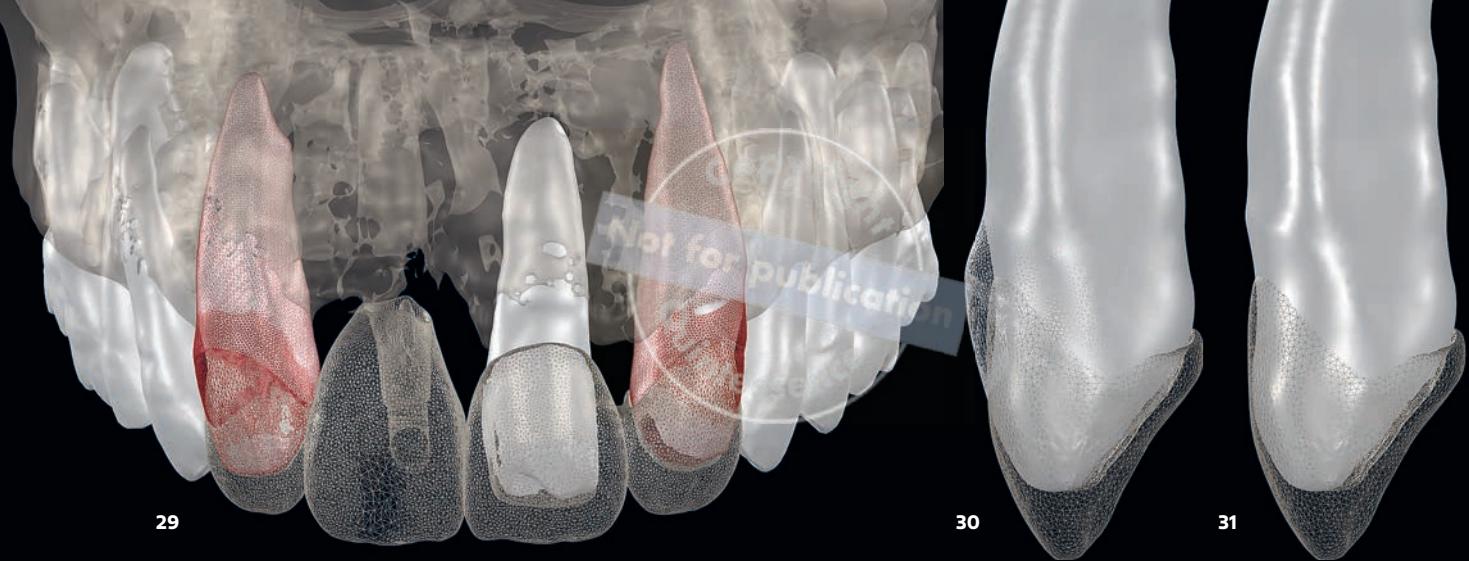
We begin the design process in 2D, using image-based simulations to immediately integrate the prosthetic plan with the patient's facial features. This step allows us to select the appropriate tooth forms based on esthetics and harmony with the smile. Once the ideal forms are chosen, we transition to 3D design, where these shapes

are adapted to the specific clinical and biologic conditions. The goal is to arrange the selected forms in a way that best fits the tissues and surgical possibilities, ensuring both esthetic integration and functional success (Figs 8 to 10).

### Design validation: Digital simulation and intraoral try-in

Once the 3D design is completed, it is evaluated using facial simulation in Smilecloud, allowing us to assess incisal edge position, curvature, tooth proportions, and overall harmony in relation to the face (see Figs 9 and 10). To further validate the design, an additive snap-on prototype is created (Figs 11 and 12). This intraoral try-in helps confirm esthetic and functional parameters directly in the patient's mouth and face.

Each validation method has its limitations. The facial simulation is not entirely realistic and may not reflect subtle intraoral details. The snap-on, being additive, can make the teeth appear slightly larger by pushing the incisal edge and curvature outward. Combining both tools provides a reliable and comprehensive way to fine-tune the final design before proceeding.



## Crown preparation strategy

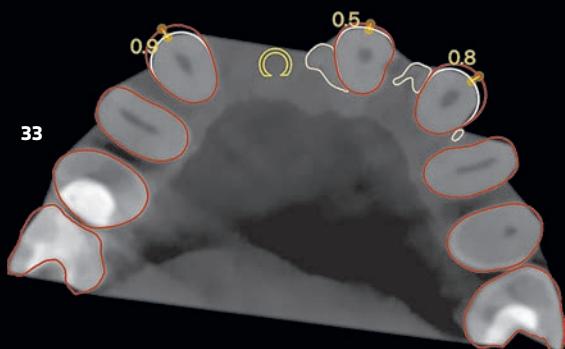
To facilitate precise reshaping of the canine crowns and allow flexibility in margin placement for optimal soft tissue support, we used a vertical preparation technique. This approach provides greater control over the emergence profile and helps achieve a more natural integration with the gingiva (Figs 29 to 31).

## Design-guided preparation

A key factor in this phase is using the digital design to guide the preparation. We remove excess hard tissue to allow for minimal material thickness while preserving the exact tooth forms selected in the design. The finish line is placed according to the design, typically about 0.5 mm apical to the planned restoration margin, ensuring ideal soft tissue support and seamless integration (Fig 32).



It is crucial to measure the remaining dentin thickness around the pulp, as preserving sufficient dentin is key to maintaining pulp vitality (Fig 33).





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## Conclusion

In complex esthetic treatments, the final result depends on the successful execution of many small but critical steps. A well-established initial digital design plays a pivotal role, serving as a consistent guide throughout every phase of the workflow.

It begins with treatment planning, where the design helps define goals and limitations. During the surgical phase, the

design guides the root reshaping, the 3D positioning of the implant, and the precise stabilization of the graft. In the prosthetic phase, it informs the crown reshaping and the accurate placement of the finish line. Finally, the production of the crowns is done strictly according to the initial design, ensuring harmony, function, and long-term stability.

This design-driven approach brings precision, predictability, and coherence to even the most challenging esthetic cases.