The CopyCAD

Dr. Yassine Harichane, France

Introduction

Nature has always captivated us with its beauty. Whether it is a landscape, a sunset or the details of a leaf, one always marvels at the natural aesthetic. The goal of an artist is to copy nature in every medium: painting, sculpture, music, or photography. It is easy to see parallels within dentistry. The teeth and soft tissues display details on the macroscopic and microscopic scale that make up all their beauty. Even the smile has characteristics that define what is beautiful and what is not. Like an artist, the dentist and the dental technician use all their combined talent to create life-like restorations. The secret to imitating nature is in the details of daily practice and hard work.

Fortunately for dental practices and laboratories, technology has advanced considerably, making the ability to imitate nature much more achievable while paving the way for new practical methodologies. Performing a single restoration on a central maxillary incisor is a challenge, both technically and artistically. Whether it is a filling, a crown or an implant, all the skills of the artistic dentist must come into play because the patient naturally expects a symmetrical result to the contralateral tooth. Using the latest technology, it is as simple as the copy/paste function one is so accustomed to using on a computer. The dentist has gone from being an artist to a computer scientist with the same optics: copy nature in all its perfection.

Using a clinical case without the utilization of an intraoral scan, we will see a workflow with CAD/CAM technology. This means the ability to copy nature has now become accessible to all practitioners.

Preparation

In this clinical case (fig. 1, fig. 2), the patient wants to improve the aesthetic aspect of her smile without losing some unique features she has come to consider a part of her “look” and personality.

Fig. 1: Initial smile

Fig. 2: Initial situation

The maxillary anterior teeth show caries and defective restorations, but their overall shape is satisfactory and carry a certain charm despite their defects. Although premolars do not have an optimal aesthetic appearance, the patient’s budget is limiting treatment to the incisors and canines.

The first step is to take an impression of the preoperative oral condition. Although the dimensions and appearance do not conform to all the rules of dental aesthetics, they are preserved because they have characteristics specific to the patient and they respect the occlusal dynamics. The impression of the teeth can be taken with an intra-oral scanner. However, the number of dentists who own intraoral

scanners is relatively low. The current materials allow for a satisfactory physico-chemical impressions and remain accessible to all dentists. A vinyl polysiloxane impression in 1 step and 2 viscosities (V-Posil Putty Fast & X-Light Fast, VOCO) is performed to record the initial clinical situation (fig. 3).

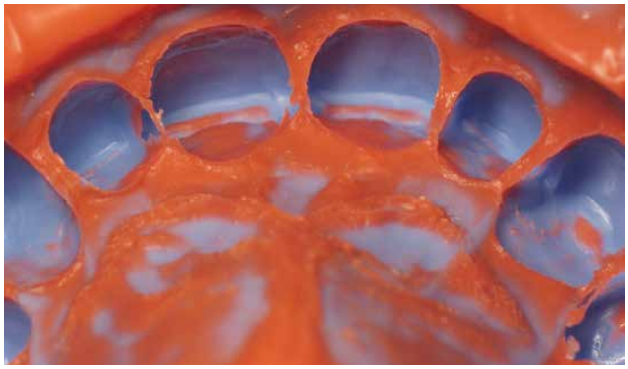

Fig. 3: V-Posil impression

Temporization

The second step is to prepare the temporary crowns by copying and pasting the patient's teeth. After preparing the teeth, the impression is sent to the laboratory, which will scan and design the provisional crowns. Most CAD/CAM software possesses this "copy and paste" function (fig. 4) so the scan and design processes take less than 1 hour.

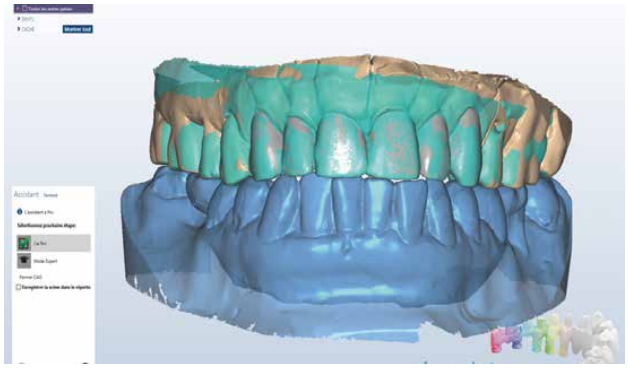

Fig. 4: Screenshot of the design software (exocad version 2015.3)

The 6 provisionals are then milled with imes-icore 250i over the course of 1h 30min in a composite disc suitable for long-term temporaries (Structur CAD, VOCO) (fig. 5, fig. 6). Finishing the provisionals - checking the contact points, controlling the occlusion and polishing - requires 30 minutes, so the crowns can be delivered 2 days after the impression. The result obtained is strikingly natural (fig. 7) thanks to the material's aesthetic properties: natural shade, easy polishing and improvable with characterization.

Fig. 5: Structur CAD disc

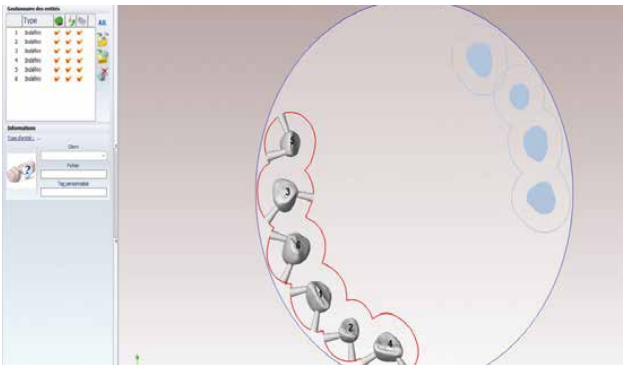

Fig. 6: Screenshot of the nesting software (Work NC Dental version 2018 R2)

Fig. 7: Structur CAD provisional crown

Concerning the form, the temporaries have an asymmetry that is found only in nature because it is both spontaneous and pleasant. They are temporarily sealed in the mouth to validate the prosthetic project (fig. 8, fig. 9).

Their biocompatibility clinically allows for a 3-year maximum period in which they can be worn, making it a material perfectly suited for complex cases, or those requiring periodontal rehabilitation. Their composition allows not only for excellent resistance to abrasion, but also the ability to be repaired with a compatible composite. In this clinical case,

the provisionals were kept in the mouth for 1 week – the time needed to prepare the final restorations. No defects were observed.

Fig. 8: Provisional crowns try-in

Fig. 9: Smile with provisional crowns

Finalization

During the last stage, after the functional and aesthetic validation of the provisionals, final porcelain crowns (IPS e.max, Ivoclar Vivadent) were milled by also copying the pre-operative situation from the original scan. The temporaries are then removed, and the underlying teeth were cleaned. After fitting and validation within the mouth, the final crowns were luted (Futurabond DC & Bifix QM, VOCO) (fig. 10).

Fig. 10: Porcelain crowns luted with Futurabond DC & Bifix QM (VOCO)

The final result is a harmonious smile that does not distort the features the patient considers to be an important part of her facial "personality" (fig. 11).

Fig. 11: Final Smile

Therapeutic success is measured by dental and periodontal health as well as by patient satisfaction and feedback from the healthcare team. The skills of a caregiver are not limited to just making the right diagnosis or defining the ideal treatment plan. Technical skills are essential and mimicking nature is a daily challenge.

Discussion

Dentistry has come a long way with the introduction and implementation of digital technologies, becoming faster and more precise as a result. These tools are becoming more and more popular and many practitioners are quickly equipping their offices and operatories. Contrary to what one might think, the acquisition of an intra-oral scanner for the office is not an absolute obligation for one to take advantage of the digital dentistry revolution. Digital dentistry, above all, is a concept and we have just seen that it allows for an unsuspecting and perhaps surprising function: copy and paste.

The advantages of copy-pasting are numerous and benefit everyone involved: dentist, dental technician and patient.

For the dentist, the main advantage of copying and pasting is getting an intuitive result. On the one hand, the current materials (composite and porcelain), allow for a natural rendering. On the other hand, digital technology makes it possible to copy nature with all of her details. The use of computer-generated temporaries makes it possible to validate complex or demanding projects. In the end, restorations are both functional and aesthetic. They integrate perfectly with the occlusion because no major changes have been made. In addition, they integrate with the overall harmony of the face.

For the dental technician, the copy and paste function is part of their skill set. On the one hand, the laboratory scanner can capture every detail of the dental arch. On the other hand, milling machines can deliver strictly identical crowns over and over again as needed. The milling of a provisional disc or block will therefore validate the therapeutic project before moving to more expensive materials such as zirconia or lithium disilicate. In the same way, if returned to the laboratory, the cost will be lower by using a millable temporary composite. After provisionals are validated, the dental technician only needs to press a button to start producing the final crowns in the desired material.

For patients, digital dentistry is an education on just how far dentistry has evolved, with technological advancements in clinical procedures replacing so many of their bad childhood memories. It is now possible for the patient to reclaim the smile of their 20's. Better still, it is possible to copy the child's juvenile smile and place it in the deteriorated dental arch of the father. The smile will become a legacy that will be passed down through families.

Conclusion

Technology is making significant progress in dentistry, it is up to us to appropriate it. The emergence of new tools such as intra-oral scanners and unique new materials - like millable temporary composites - makes it possible to design new therapeutic concepts and procedures. Copy and paste is now a part of the dentist's, and dental technician's, therapeutic armamentarium.

A Copycat is an artist who tries to capture nature in all its glory through painting. Now, a CopyCAD is an artist who can capture nature in all its perfection through CAD/CAM technology.

Disclosure

The author did not report any disclosures.

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Dr. Yassine Harichane
France