Efficient Treatment Planning Using a Digital Workflow

Technologies optimize aesthetics, improve patient care experience

Introduction

Almost every dentist who treats a patient requiring multiple single-unit indirect restorations either creates chairside provisionals or requests that the laboratory fabricate a shell that the dentist must then reline. In either case, the aesthetic result is usually less than ideal, the fit is poor and the reline material does not match perfectly. Additionally, with each reline, occlusion might require an adjustment because of polymerization shrinkage. These procedures are time-consuming and tedious for both dentist and the patient.

Such inconveniences are considered part and parcel of indirect restorative procedures. Patients and dentists have begrudgingly come to accept that multiple appointments are required for taking uncomfortable and unpleasant impressions—or, worse yet, remaking them, viewing hard-to-visualize-the-real-thing wax-ups, and placing, removing and replacing temporary restorations ... all before the final restorations are even delivered. However, with a digital dental workflow, all of that changes.

Imagine only two clinical visits for provisionalizing and delivering a treatment involving multiple single-unit restorations. While it may have been unheard of just five years ago, it’s becoming increasingly commonplace throughout dental practices today when intraoral scanners, in-office CAD/CAM and aesthetic high-strength millable provisional and definitive restorative materials are used. In fact, when digital dental technologies such as these are in the practice, they improve the clinical workflow, practice efficiency and overall patient care experience.1

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In the case of an 80-year-old patient who presented with caries on five of his maxillary anterior teeth (Figs. 1–5), digital dentistry eliminated previous difficulties with indirect restorative dentistry and simplified the overall process.

Consultation appointment

Intraoral scanners eliminate the need for physical impressions and help minimize the disadvantages associated with conventional impressions such as material costs, remakes, inaccuracies, storage and manual handling. They also relieve patients of the discomfort and time typically required for taking traditional impressions. Then, when combined with CAD technology, the intraoral scans can be used to create a digital diagnostic wax-up, which serves as a virtual tool for treatment planning and patient understanding.

In this case, the patient was less concerned with aesthetics, but he understood the necessity of treatment based on the extent of his caries. Upon seeing the proposed treatment plan, he accepted the recommendation for full-coverage restorations.
First clinical appointment

With patient acceptance of the treatment plan, CAD/CAM technology can be used to easily design and fabricate provisional and definitive restorations. Provisional restorations serve as the basic template for the definitive restorations and ensure their predictability by confirming the design of the occlusion, structure and shape of the proposed restorations.

Fig. 9: The teeth were prepared for full-coverage restorations, retracted and scanned, after which the patient took a break while remaining in the dental office.

Fig. 10: Incisal view of the preparations.

Fig. 11: The scanned preparations were articulated with the opposing teeth.

Fig. 12: Alternate view of the scanned preparations.

Fig. 13: The original restoration design created during the consultation appointment was superimposed over the scanned preparations.

Fig. 14: Based on the original design and preparations, a set of provisional restorations was milled in the office from a PMMA material puck (Telio CAD, Ivoclar Vivadent) in a dry mill (Wieland Zenotec Hybrid Select, Ivoclar Vivadent). As many as 30 units can be manufactured from one millable puck at a time.

Fig. 15: The provisional restoration was cut from the puck, trimmed and polished.

Fig. 16: The patient was brought back into the operatory for provisional try-in. No adjustments were required to the margins, occlusion or aesthetics; the mill copied and manufactured the original patient-approved design, and it fit as precisely on the prepared teeth as a final crown would.

Fig. 17: The provisional was temporarily cemented and the patient was given an opportunity to “test-drive” what is essentially a dynamic mock-up for a week or so to verify that aesthetics, speech and function were acceptable. The patient could experience exactly what his teeth would be like in final restorations. In this case, the patient called to report that he loved the provisionals and didn’t want to change anything—there was no need for him to return to the practice.
Fabrication of final restorations

With computer-aided manufacturing (CAM) technology, lithium disilicate blocks (e.g., IPS E.max CAD) are milled into restorations, rather than using traditional pressed processes, to impart monolithic strength to the restorations. Using in-office wet milling technology (e.g., E4D/Planmeca), simple restorations can be completed in one visit, while more complex treatments can be completed much more efficiently.

The monolithic properties of machinable lithium disilicate also contribute to its high aesthetics. With a single ceramic block, a full-contour restoration fabrication eliminates the challenges associated with working with different materials. Although lithium disilicate achieves high aesthetics without the need for layering, it can be layered, stained and glazed for more individualized characterization and anterior restorations.

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Fig. 18: The final approved restoration design was used for milling the definitive restorations.

Fig. 19: View of the designed restorations, with color turned off.

Fig. 20: The restoration design was superimposed into the scan of the preparations.

Fig. 21: Alternative view of the restoration design superimposed onto the preparations, with color turned off, before milling. A 3D-printed model of the preparations was also created for use in making the surface texture and viewing the arrangement of the five monolithic units.

Figs. 22 and 23: The monolithic lithium disilicate crowns were stained, glazed and placed onto the printed model and ready for delivery.

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Second clinical appointment

At the second clinical visit, the provisional restorations were removed, the preparations cleaned, and the final restorations cemented (Figs. 24 and 25). Patient satisfaction was extremely high because there was no need to adjust the color, margins, length or occlusion. The final restorations precisely duplicated the proposed and approved treatment plan, which was the basis for the provisional restorations.

Fig. 24: View of the definitive restorations after cementation.  
Fig. 25: Note the surface texture and color nuance of the final restorations, which were designed identical to the provisional and originally approved treatment plan.

Conclusion

There are many different digital dental workflows. Some dentists just starting out with CAD/CAM only scan and send the scans to the laboratory for use in fabricating or manufacturing restorations. Other dentists scan and only manufacture lithium disilicate restorations, which requires a wet mill. Still other dentists, like myself, mill PMMA provisional (dry mill) and lithium disilicate restorations.

Milled PMMA provisional restorations look and fit better than anything I could have made by hand, and they’re much less costly because the mill does the tedious work in 20 minutes. In the past, this took laboratory technicians two to three hours to complete. The patient enjoys the benefit of trying a dynamic mock-up of the treatment design—as opposed to a white wax try-in, and everyone in the restorative process experiences an improved clinical workflow and practice efficiency when digital dental technologies are used.

References