A 2017 GUIDE TO

CAD/CAM & CHAIRSIDE MILLING

CE Course: CAD/CAM: Chairside Milling P. 2

CASE PRESENTATION: The Power and Simplicity of Digital Impressions P. 10

Same-Day Dentistry in the Big City P. 13

CASE PRESENTATION: Immediate Guided Implant Emergency Case Using CEREC P. 14

Embracing Technology for Growth P. 17

The Hidden Cost of Your Time P. 18
Chairside Milling

ABSTRACT

CAD/CAM technology has helped to transform the manner in which restorative treatment can be provided. In particular, the ability to provide patients with single-visit indirect restorations is appreciated by clinicians and patients. Chairside milling produces restorations that are at least as accurate as traditionally fabricated indirect restorations. Chairside milling also allows clinicians to optimize the process flow, reducing chairside time, increasing efficiency, and saving patients additional visits. As with other procedures, each step must be accurately performed. Once the learning curve has been mastered, chairside milling represents an accurate method to provide patients with efficient and esthetic restorative care.

LEARNING OBJECTIVES

The overall goal of this course is to provide information on CAD/CAM dentistry and the chairside milling of indirect restorations. After completing this course, participants will be able to:

1. Describe the key attributes of single-visit indirect restorative dentistry;
2. Review the process workflow options with CAD/CAM and chairside milling of restorations;
3. List potential advantages and disadvantages of chairside milling;
4. Describe the impact of CAD/CAM and chairside milling on office efficiency and patient satisfaction.

ABOUT THE AUTHOR

Tarun Agarwal, DDS

Dr. Tarun Agarwal represents the next generation of leadership for the dental profession. As a respected speaker, author, and opinion leader, he is changing the way general dentists practice. His common-sense approach to business, dedication to clinical excellence, integration of technology and down-to-earth demeanor have made him a recognized educator. Dr. Agarwal received his dental degree from the University of Missouri at Kansas City and practices in Raleigh, North Carolina.

Introduction

CAD/CAM has become mainstream and has changed dentistry, particularly in the fields of restorative and implant dentistry. Single-unit crowns are the most frequently provided indirect restoration and, together with inlays and onlays, were the first to be provided using CAD/CAM technology. Since then, bridges, veneers, post-and-cores, and implant abutments and restorations have all been created using CAD/CAM dentistry.

Fabrication of a CAD/CAM restoration may occur in a laboratory after sending the digital files through a secure internet portal, either in a central location designated by the CAD/CAM system’s manufacturer or in laboratories that are authorized by the manufacturer. Such systems are “closed” systems. Increasingly, systems are “open,” meaning that any laboratory with the capability to use the software can fabricate the restoration using virtual models and CAD/CAM milling, or by milling a model and
then using a traditional technique to fabricate the restoration.

With digital impressions, a scan is taken of the clinical site, adjacent teeth, and opposing arch, after which the scans are transformed into images for immediate viewing on the screen. This allows the clinician to check the preparation for any deficiencies on a large screen and to immediately correct any deficient areas. From there, the restoration can be designed and fabricated. In contrast, with traditional impressions and a traditional technique, it may be more difficult to spot marginal defects in the impression, and models must be poured from these. Inherently, there are more opportunities for errors with a traditional technique, from defects in impressions or models to manual fabrication of the final restoration. Scanning of traditional impressions is a third option—this does digitize the information, allowing for CAD/CAM fabrication of the restoration; however, it will also scan any impression errors. A CAD/CAM milling unit may also be incorporated into the dental office, making it possible to mill restorations chairside while the patient is in the office.

**Chairside Milling**

In addition to the obvious advantage of being able to provide single-visit indirect restorations that are esthetic and accurate, chairside milling reduces the time required for restorative care, does not require delivery of a provisional restoration, and gives the dentist complete control over the procedure and the process workflow. A further advantage is the ease with which digital scanning and chairside milling can be performed in challenging situations, such as treating elderly patients with reduced cognition, or patients with limited mobility or ability to tolerate long treatments. Conversely, the cost of chairside-milling technology is a capital investment not required if laboratory milling is performed, and there is a learning curve associated with its adoption by the dental team and optimization of process workflow, including delegation of tasks.

**Block Options**

Regardless of the type of restoration, CAD/CAM milling begins with a CAD/CAM block and should end with an esthetic result even for challenging cases. Options include zirconia-based, leucite-based, and feldspar-based ceramics; lithium disilicate; and composite blocks. All-ceramic CAD/CAM blocks offer strength and esthetics, including a chameleon effect. The preparation design must take into account the type of block being used, and provide the correct preparation form and clearance for that material. CAD/CAM materials blend well, allowing margins to be placed supragingivally or pergingivally.

### Accuracy and Longevity of CAD/CAM Restorations

Several studies have determined that CAD/CAM restorations in general have a marginal fit at least equivalent to those fabricated using traditional impressions and laboratory techniques. In vivo and in vitro studies have also assessed overall accuracy and fit of single-unit crowns milled using all-ceramic, zirconia, or lithium disilicate blocks, and found these to be acceptable and comparable to the use of a traditional technique. Similarly, single-unit implant crowns and abutments were clinically accurate in other studies. In one recent review, the long-term survival rate for single-tooth indirect restorations was similar following digital or traditional fabrication.

A significant number of studies have been conducted on chairside-milled restorations using ceramic and composite block materials. The marginal and overall fit of chairside-milled restorations was found to be at least as accurate as those fabricated using traditional methods; the materials were also found to offer sufficient strength and fracture resistance and clinically acceptable outcomes. In addition, the 5- and 10-year survival rates for chairside milled restorations were found to be 97% and 90%, respectively, in one review.

### Process Flow

The process flow when providing patients with single-visit CAD/CAM restorations can be simple. After scanning and verifying the margins, interocclusal clearance, and proposed restoration design, it’s simply a matter of waiting for the restoration to be milled, any necessary staining and glazing or sintering, and trying in the restoration and seating it. In cases where the shape of the teeth must be duplicated, scans of the pre-existing teeth shapes can be made.

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<th>Table 1: Chairside milling</th>
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<tr>
<td><strong>POTENTIAL ADVANTAGES</strong></td>
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<tr>
<td>Single-visit indirect restorations</td>
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<td>No provisional phase</td>
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<tr>
<td>Efficiency</td>
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<tr>
<td>Esthetic results</td>
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<tr>
<td>Options to stain and glaze</td>
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<tr>
<td>Patient acceptance</td>
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<tr>
<td>Control of process</td>
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<td><strong>POTENTIAL DISADVANTAGES</strong></td>
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<td>Cost of acquisition</td>
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<tr>
<td>Learning curve</td>
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<td>Difficulty delegating tasks</td>
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and used as a virtual template for the restorations, provided the intent is to have restorations with the same shape. This reduces the likelihood of adjustments being needed or patient dissatisfaction.

Chairside milling also allows you to use a process flow that optimizes the treatment schedule by performing other procedures in the same visit as well as delivering the final restoration without an intermediate provisional phase (Figure 1). During the time of onset of local anesthesia, scans of the opposing dentition can be made as well as of the existing teeth at the site(s) if the same shape is desired, and the shade can be selected. Later in the appointment, while waiting for the restoration(s) to be chairside milled, and finished, other treatment needs can be addressed in the same visit. Treatment such as a direct composite restoration or endodontic therapy can be completed, if appropriate, while the restoration is being milled. This saves chairside time, maximizes efficiency, and saves the patient another visit.

**Efficiency (Speed)**

CAD/CAM imaging and chairside milling together save valuable time by streamlining treatment and permitting delegation of significant portions of the process. In one study, digital scanning alone saved dentists 55% of the time previously required to take a traditional impression. Digital images are immediately available for examination, such that any imperfect areas of a preparation can be adjusted and rescanned if necessary, without the patient having to return. Studies have shown that significant time savings can be achieved using CAD/CAM software and milling machines. In addition, CAD/CAM software now has automated marking and evaluation of margins, and uses digital articulating paper to rapidly determine the occlusion and interdigitation of teeth in opposing arches. Full-color images have also made it easier for us to view margins and other aspects of the preparation. The case below shows use of CAD/CAM and chairside milling for a single-unit esthetic anterior restoration.

**Case 1**

The patient in this case was a 35-year-old female who arrived with a fractured upper left canine. The patient was not experiencing any pain. After a clinical evaluation including a periapical radiograph and discussion with the patient, it was determined that the tooth was nonvital and would require root canal treatment if it were to be saved and crowned. Although the crown on the adjacent bicuspid was white, and the anterior composites were discolored with areas of microleakage, the patient declined to have these treated at this time. Together with the patient, we therefore decided that the best option was to perform same-day root canal therapy and fabricate a chairside-milled crown for same-day placement (Figures 2, 3). Our patient had experienced moderate levels of caries and had recurrent caries in the tooth being treated. Of relevance, one of the benefits...

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**Figure 1**—Process flow.

**Figure 2**—Initial presentation.
shown for CAD/CAM restorations has been a potential decrease in recurrent caries believed to be a result of the excellent marginal fit of these restorations.19

We first performed the root canal therapy and removed dental caries before placing a fiber post cemented with a self-adhesive resin composite luting agent and creating a resin composite buildup around this (Figure 4). The preparation and margins were then finalized. Given the patient’s low lip line and smile line, together with the availability of esthetic restorative materials, a perigingival margin was created. This would provide the best biocompatibility with the gingival architecture (Figure 5).

My assistant then placed gingival retraction cord and took a scan of the preparation and surrounding dentition, as well as the opposing arch. After this, the digital images were reviewed to check the margins and the scans overall. Subsequently, the full-color software provided an image of the proposed restoration for us to check on the screen (Figure 6). The shade had been determined using natural northern light. With current CAD/CAM systems, shade selection for each tooth can be automated or determined by the software, providing a reliable comparison point with assessing the shade(s) you have selected. This has two advantages—it saves time, and it removes subjectivity in shade selection, thereby reducing the likelihood of errors in shade selection. After the proposed restoration was accepted, it was milled while the patient waited in the office.

We verified the fit of the milled crown, then stained it where required for customization and glazed the crown. Historically, one of the drawbacks of CAD/CAM restorations milled chairside was the time required to stain and glaze a chairside-milled restoration. Compact technology has been introduced that significantly speeds up the stain and glaze process. The crown was cemented using a self-etch resin composite luting agent. After seating the crown, we waited until the cement had reached the gel phase,
making it possible to easily peel away the excess cement using an explorer before final curing (Figures 7–8).

**Case 2. Implant Placement and Restoration**

In the case shown here, the patient had fractured the root of an endodontically treated upper right molar. It was determined that the tooth was hopeless and would need to be extracted. The patient opted for immediate implant placement. After scans were taken, the surgical guide was created for optimal positioning of the immediate implant, and the implant was provisionalized. After osseointegration, the patient returned for the final indirect restorations. A scan body was placed over the implant-abutment complex, and the area was scanned using CAD/CAM software (Figure 9). Subsequently, we were able to view the proposed restoration design, which was then milled chairside before being placed and screw-retained (Figures 10–12). This procedure was streamlined with chairside milling.

**Patient Benefits**

For patients, chairside CAD/CAM restorations offer significant benefits. One-visit restorations are possible, with same-day preparation and placement of indirect restorations. The convenience and experience of digitally scanned, chairside-milled restorations result in high levels of patient satisfaction. Overall, patients have been found to prefer digital scans, which are less unpleasant and less likely to induce gagging than traditional impressions.20,21 Patients have also indicated a preference for single-visit indirect restorations.22 In addition, the chairside-milled restoration looks lifelike and natural.
Conclusions

Digital impressions can be taken and restorations created that rival traditional techniques for form and esthetics. Of course, care must be taken to ensure that the digital scans are accurate and that preparation and milling procedures are properly executed. Once the learning curve has been mastered, chairside milling provides an easy and efficient method to provide restorative care. The process workflow with chairside milling can be streamlined and efficient dentistry provided. Chairside time is optimized, accurate and esthetic restorations can be provided, and patient satisfaction is excellent.

References

4. Hirayama H, Chang YC. Fit of zirconia copings generated from a digital impression technique and a conventional impression technique. Tufts University of Dental Medicine master's thesis.
1. __________________ are the most frequently provided indirect restorations.
   a. Three-unit bridges
   b. Single-unit crowns
   c. Veneers
   d. Inlays

2. Digital impressions are transformed into images for immediate viewing on the screen, allowing the clinician to check the preparation on a large screen and to immediately ___________.
   a. adjust the software image
   b. ask the laboratory to adjust any deficient areas
   c. correct any deficient areas
   d. make an extra appointment for the patient

3. Scanning of traditional impression allows adjustment of any impression errors.
   a. True
   b. False

4. Chairside milling __________________.
   a. can be advantageous when treating elderly patients
   b. reduces the time required for restorative care
   c. gives the dentist complete control over the process
   d. all of the above

5. Studies have found the accuracy and fit of single-unit crowns milled using ___________ blocks to be acceptable.
   a. zirconia
   b. all-ceramic
   c. lithium disilicate
   d. all of the above

6. In one review, the 10-year survival rate for chairside-milled restorations was ___________.
   a. 80%
   b. 85%
   c. 90%
   d. 95%

7. As one of the steps for chairside milling and provision of single-visit restorations, scans of the pre-existing teeth shapes can be made and used to create a ___________.
   a. provisional restoration
   b. virtual tray for the scan
   c. digital template to duplicate the shape of the teeth
   d. mouth guard

8. Chairside milling makes it possible to perform other procedures while the restoration is being milled.
   a. True
   b. False

9. In one study, digital scanning saved dentists ___________ of the time previously required to take a traditional impression.
   a. 25%
   b. 35%
   c. 45%
   d. 55%

10. Digital articulating paper ___________.
    a. does not yet exist
    b. must be blue for accuracy
    c. allows rapid determination of the occlusion
    d. b and c

11. One of the potential disadvantages of CAD/CAM and chairside milling is the ___________.
    a. learning curve required after adopting this technology
    b. resistance from patients
    c. need for remakes
    d. none of the above

12. When performing CAD/CAM restorations, the preparation design must take into account the ___________.
    a. form and clearance required for the block material being used
    b. shade required
    c. patient’s age
    d. time required

13. The marginal fit of CAD/CAM restorations in general, compared to traditional restorations, is ___________.
    a. usually almost equivalent
    b. at least equivalent
    c. always inferior
    d. always superior

14. CAD/CAM software now offers automated marking and evaluation of margins.
    a. True
    b. False

15. A potential decrease in recurrent caries with CAD/CAM restorations is believed to be due to ___________.
    a. patients’ resulting motivation to floss
    b. their excellent marginal fit
    c. their internal fit
    d. the materials used

16. Having software that can assess the shades of teeth adjacent to the preparation can ___________.
    a. save time
    b. help provide verification of the shade you have selected
    c. remove all possibility of needing to do any staining or glazing
    d. a and b

17. Compact technology has been introduced that significantly speeds up the in-office stain and glaze process.
    a. True
    b. False

18. The ability to remove excess cement during a gel phase makes it ___________.
    a. impossible to leave any behind
    b. easy to peel away before the final cure
    c. more radiopaque
    d. easier to dissolve any residual cement afterward

19. Patient preference and satisfaction with single-visit milled restorations is good due to the ___________.
    a. needle-free experience
    b. the overall convenience, experience, and reduced likelihood of gagging
    c. lack of taste associated with scanning
    d. ease of adjusting the occlusion after seating

20. The process workflow with chairside milling allows for ___________.
    a. optimized chairside time
    b. accurate restorations, provided steps in the process are properly followed
    c. esthetic restorations
    d. all of the above
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EDUCATIONAL OBJECTIVES
1. Describe the key attributes of single-visit indirect restorative dentistry;
2. Review the process workflow options with CAD/CAM and chairside milling of restorations;
3. List potential advantages and disadvantages of chairside milling;
4. Describe the impact of CAD/CAM and chairside milling on office efficiency and patient satisfaction.

COURSE EVALUATION
Please evaluate this course using a scale of 3 to 1, where 3 is excellent and 1 is poor.

| 1. Clarity of objectives | 3 | 2 | 1 |
| 2. Usefulness of content | 3 | 2 | 1 |
| 3. Benefit to your clinical practice | 3 | 2 | 1 |
| 4. Usefulness of the references | 3 | 2 | 1 |
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AGD Codes: 610, 784

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SPECIAL CODE ____________________________
CASE PRESENTATION

The Power and Simplicity of Digital Impressions

By Walter Renne, DMD, Tony Mennito, DMD, and Tyler Parrish

Digital technology is constantly improving the efficiency with which we carry out patient treatment. The speed and accuracy of intraoral digital impression systems is perhaps the area in which this improvement has been most significant. Upgrades to both hardware and software allow for not only more expedient treatment, but also for more predictable clinical results. The coupling of powerful planning tools within the Planmeca Romexis software with the speed, accuracy, and ease of use of the Planmeca Emerald scanner offers many advantages to both the patient and practitioner.

The option of a single-visit smile can be very attractive for patients due to minimal interruption of their everyday lives. The temporary stage can often be problematic and frustrating for both patient and clinician. The potential for skipping this step can be attractive to both parties but does require more extensive planning leading up to execution of the treatment plan. The Planmeca Romexis smile design software provides a simple tool that allows the patient and dentist an opportunity to try out different shade options, smile designs, and tooth shapes, ensuring that a common vision is shared for final prosthetic design. The software also allows you to export your smile design into the CAD software to ensure that it is replicated in the final design or wax-up. Printing of the resulting model can be used to mock up or temporize the patient if required.

Case in Point

A patient presents with the chief complaint, "I do not like my smile" (Figure 1). She was given several options, including comprehensive orthodontic therapy as the best and most conservative option. After detailed discussion of the various treatment options, the patient decided she wanted ceramic restorations and esthetic crown lengthening.

The first step in the treatment planning process is to determine feasibility of restorative work. Quality full-face smile and retracted intraoral photographs are taken, along with a high-quality intraoral digital impression. With input from the patient, the smile is designed using the Smile Design software (DSD) software (Planmeca Romexis) integrated with the Planmeca Emerald scanner (Figure 2). Next, the DSD is integrated into the Planmeca PlanCAD Easy* design software for virtual waxing of the case. This virtual wax-up will be 3D-printed for patient approval as well as to communicate to the periodontist the location of the proposed final veneers to aid in the esthetic crown lengthening surgery. This surgery was performed to ensure that the proposed final restorations would not encroach on the biologic width (Figure 3).

After healing for 10 weeks, the patient returns for same-day preparation, milling, and delivery of 5 units of cingulum preservation crowns and minimal prep veneers. The original digital wax-up that was 3D-printed and used to guide the crown-lengthening surgery is scanned into the Planmeca PlanCAD Easy software using the Planmeca Emerald scanner. This wax-up can also serve as a template to make a silicone matrix for provisional restorations in the event that the patient did not like her final milled restorations. After preparation and isolation, final impressions are made by scanning the preparation arch, opposing arch, and digital bite (Figures 4, 5). The software color-codes clearance to ensure proper material thickness will be achieved (Figure 6).
High-quality digital color models are made and margins are marked using intuitive software tools. Restorations are quickly designed, replicating the diagnostic digital wax-up that was approved by the patient (Figure 7). The restorations were sent for milling using the Planmeca PlanMill 40. These e.max MT restorations were then custom characterized, glazed, and fired to achieve a more natural appearance. After patient approval, the final e.max restorations were treated with Monobond etch and prime (Ivoclar Vivadent) for 1 minute and bonded in place using Optibond XTR adhesive (Kerr Restoratives) and Variolink Esthetic (Ivoclar Vivadent) cement (Figures 8, 9).

*Available in the United States, Planmeca PlanCAD software performs the same functions as Planmeca PlanCAD Easy, which is offered internationally.

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**Figure 1**—Preoperative photo

**Figure 2**—The smile is designed using Planmeca Romexis Smile Design software with scans from the Planmeca Emerald scanner.

**Figure 3**—Esthetic crown-lengthening surgery ensures that the final restorations would not encroach on the biologic width.

**Figures 4, 5**—After preparation and isolation, final impressions are made by scanning the preparation arch, opposing arch, and digital bite.

**Figure 6**—The software color-codes clearance to ensure proper material thickness will be achieved.

**Figure 7**—Restorations designs replicate the diagnostic digital wax-up.

**Figures 8, 9**—The patient’s new smile is revealed in the retracted and final smile photos.
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I love being able to do one-visit dentistry. It's a good fit for my kind of patients. I practice in New York City, where we have a lot of transient people. It could be someone who just flew in for a vacation, or someone who might be working in town temporarily. We are located close to the United Nations building and have handled some emergencies. People were happy with the results, so we're now on their list if a diplomat is having trouble with a tooth. Regardless of what city or area you're in, people will find you online or by word of mouth if you can provide same-day dentistry.

The most common cases I see are as simple as a broken tooth, such as a missing whole or partial cusp, which would warrant a crown. With transient patients, you can put them in temporaries, but they're unlikely to go see their home dentist for the permanent restoration anytime soon. They're often too busy, or they've traveled to another country where the temporary broke and they saw yet another new dentist. The beautiful thing about using CAD/CAM technology is we're able to provide them with a final restoration right then and there, usually within 2 hours.

I'm a really hands-on person and enjoy using the Planmeca FIT system. I use e.max because its psi is 360, whereas a normal PFM is only 100 psi. The system also works with zirconia, but we find it can wear on opposing natural teeth. I personally think e.max is as strong as needed but much more beautiful than zirconia. I create inlays with IPS Empress, which doesn't need to be fired. You can just mill it and bond it right into place, usually in less than 2 hours.

The Planmeca FIT system is my go-to for all indirect restorations unless I need a bridge that is longer than 33 mm. The quality and strength of the milled restorations are excellent. What I really love about creating the crowns here in the office is having the ability to stain and glaze them to match patients' other teeth. Foreign dentists have sent me emails to say they were impressed with the results. One man who was so happy with the color match we achieved became our patient when he returned to New York.

Same-day dentistry is great for any patient because they don't have to leave work multiple times. If patients have to take off work, they would rather take just one day. That's the beauty of the technology. It's nice when I have a preplanned reason to use this technology, but it's great for all our patients that I am able to do things "on the fly."
Immediate Guided Implant Emergency Case Using CEREC

By Yao-Lin Tang, DDS

An emergency patient was referred with a broken tooth No. 9 (Figures 1, 2). The tooth had previously been treated with a root canal and crown, but the tooth had fractured. Because the patient lives about an hour and a half from my office, I decided to do an immediate implant with guided surgery. The Orthophos XG 3D CBCT unit and the CEREC Omnicam (both Dentsply Sirona) were used to capture an intraoral scan of her upper arch. Next the restoration for tooth No. 9 was designed using CEREC software. An SSI file was exported and imported into the Galaxis CBCT software, merging both files. This data was used to determine the best angulation for the implant, the appropriate implant crown position, and the bone condition (Figure 3).

The patient’s buccal plate is very thin. The ridge is very limited, and it would be very challenging to attempt to do an immediate implant procedure on this patient without the accuracy of a surgical guide. CEREC software was used to design a CEREC Guide 2, which was then milled with the CEREC MC XL milling machine (Figures 4A, 4B). This process takes about 30 to 40 minutes.

Tooth No. 9 was extracted atraumatically with a Benex Extractor (Benex Dent), preserving all the bone. After placing the CEREC Guide 2, the osteotomy was performed through the surgical guide. Next, the 3.3 mm x 12 mm implant was placed, a bone graft was added, and a cover screw was used to enhance healing. In order to maintain the gingival papilla, I used the CEREC to make a temporary cantilever bridge with an ovate contact on tooth No. 9 out of CERASMART (GC America). The temporary restoration was cemented using tooth No. 10 (which also needs a crown) as the abutment for the cantilever bridge. Although this was a temporary, I make temporaries with CEREC just like a permanent restoration, and I custom stain and glaze both temporary and final restorations (Figures 5A, 5B).

The patient returned after 2 weeks for a postop check, at which point the site was healing very well. When the patient returned again in 4 months, I exposed the implant, and the CEREC was used to mill a VITA ENAMIC IS custom abutment (VITA North America) to train the gingival tissue for the final restorations (Figures 6A, 6B). The patient returned in another 2 weeks for the final restoration. I used the CEREC and VITA ENAMIC IS as the abutment material for tooth No. 9 and for both final crowns (Figure 7).
Conclusion

I have been milling crowns with CEREC for many years, but now that everything is digital, we make all our implant crowns and surgical guides in-house as well. The whole procedure is “model-less,” as we don’t take any impressions. Since I started using CBCT, I use only guided surgery for implant cases. I don’t do free-hand surgery any more. Thanks to digital dentistry and CEREC, I can provide my patients with better service.
Experience the possibilities with CEREC®

For more than 30 years, CEREC has provided technological precision, superior design and excellent performance to thousands of practices. Offer the best possible treatment with single-visit restorations, digital orthodontics and integrated implantology.

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From the beginning, I was very impressed with the quality of CEREC restorations. I thought the ability to save time and offer my patients same-visit dentistry for crowns would be a differentiator in my practice. I purchased the system and my journey began. I soon realized that using CEREC isn’t just about the digital impression system and making the restoration. CEREC technology has also allowed us to have access to the latest, strongest, most esthetic materials for our patients.

Offering same-visit dentistry to my patients has also helped my practice grow. I began using CEREC effectively, and it became a key part of my business model as I expanded my practice. The whole process can be completed in a single visit. When the restoration is milling, you can use that time to interact with the patient, which allows me to create trust with the patient, raise their dental IQ, and build my practice through referrals. Beyond CAD/CAM, I purchased a Dentsply Sirona CBCT unit, the Orthophos XG 3D, for diagnosing purposes. Proper diagnosis is key because if you can’t diagnose correctly, you can’t seat properly. CBCT allowed me to look for pathologies and do implant planning, nerve localization for wisdom teeth, extractions, orthodontics, and periodontics.

What’s most interesting with Dentsply Sirona is that the digital impression we take can be merged with the cone beam volume, which is great because it allows us to do implant planning almost in reverse. We decide where the final restoration will go in the patient’s mouth virtually, we merge that volume with CBCT, and we place that volume where the implant will be placed. What’s special is that this allows us to fabricate a surgical guide that can be made in your office milling chamber. When one uses a surgical guide for implant placement, it’s very precise and allows the procedure to be done in a much shorter period of time.

My advice to other dentists is to accept the fact that technology is our greatest aid. Twenty or 25 years ago, no one had cell phones, but today we wonder how we operated without them. We have to accept the fact that things do evolve for the better and keep an open mind. We need to look at the possibilities, speak to others, do our research, and consider how it can benefit our patients and us.

**Booby Chagger, DDS**

Dr. Bobby Chagger obtained a DDS from University of Toronto in 1996. He later graduated from the Misch International Implant Institute and studied advanced functional esthetics from the Las Vegas Institute for Advanced Dental Studies. Dr. Chagger is a CEREC educator, CEREC software beta tester, and travels across North America, Asia, and Europe to work with companies to understand how new technology is changing possibilities in dentistry. He has published articles on CEREC technology and now trains other dentists in both basic and advanced dentistry using CEREC 3D.
The Hidden Cost of Your Time

When it comes to the ROI of indirect restorations, consider both the tangible and intangible costs

Dr. Tarun Agarwal uses a CAD/CAM system to make indirect restorations in-house. He’s found that it saves him, his team, and—just as importantly—his patients time. For Dr. Agarwal, one of the intangible hidden costs of traditional dentistry was just that ... time ... and he doesn’t miss those days at all.

We dentists have to start understanding that our time is the most valuable and expensive asset we have. We tend to believe that personnel, materials, and supplies are expensive—but when you boil it down, it’s really a matter of time itself being the best return on investment (ROI) in terms of our productivity. This concept should be applied to patients as well; ultimately, we have to value their time more than anything. The average patient takes about 3 hours off work for a dental appointment, so the more times they have to do that, the less productive they are, too.

So many of the intangible things that we just accept as the traditional way of doing dentistry are eliminated with chairside digital dentistry. For example, in the traditional model, patients must return to have indirect restorations placed. The cost of the time involved—from the assistant to the front-office person, setting up an appointment, and then rescheduling if the patient cancels—adds up fast. These are unrealizable costs. When comparing direct costs of single-visit dentistry vs. two-visit restorations, materials come to mind—impression material, provisional material, temporary cement, all with their guns and tips. These things add up. And don’t forget the cost of ordering and maintaining the inventory.

**Tangible Costs of Indirect Crowns**

<table>
<thead>
<tr>
<th>Lab</th>
<th>Chairside</th>
</tr>
</thead>
<tbody>
<tr>
<td>$90-$150</td>
<td>$25-$35</td>
</tr>
<tr>
<td>2–3 visits</td>
<td>1 visit (60–90 min)</td>
</tr>
</tbody>
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It’s easier to focus on the tangible ROI when a restoration is fabricated in-house. Using Dentsply Sirona’s CEREC system, the average time for an appointment with me is between 60 and 90 minutes for a single tooth restoration. Typically, my assistant takes our preliminary digital impression, which includes the bite and the opposing. Prepping the tooth varies in time, depending on the case. After isolation, I take a final digital impression. Depending on state law, the dentist can then walk away and move on to other things, such as another patient. A well-trained assistant can do the design and start the milling process, which usually takes 8 to 14 minutes. It takes 5 to 8 minutes to design the restoration, including processing. While the machine is milling the crown, the assistant is free to do other things. When the milling is finished, the assistant makes sure it fits and polishes it or puts it into an oven, which takes 5 to 16 minutes. At that point, the dentist comes back to deliver it, which can take 5 to 10 minutes when you’re bonding it in. Much of the process can be delegated to an assistant, saving the dentist time.

A good example of understanding the value of time is when something needs a remake or adjustments, we don’t have to start the process over again—we can immediately correct it right in the office. For example, if the color is not right, I can literally just click “mill” again and have a different color restoration ready to go, which is a tremendous advantage.

I like knowing that I’m saving myself and all parties involved time and money, while having the satisfaction of creating indirect restorations myself.
Attracting and keeping patients is more important than ever. With Henry Schein as your trusted advisor and our expanded portfolio of CAD/CAM solutions, your patients can enjoy an enhanced treatment experience while spending less time in the dental chair.

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- Delivering predictable, quality dentistry
- Improving your efficiency and productivity

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