Accelerated treatment protocols: Full arch treatment with interim and definitive prostheses

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With the advent of titanium, root form implants, and osseointegration, dental treatment has undergone a metamorphosis in recent years. These new techniques enable dentists to provide anchorage for various kinds of prostheses that improve masticatory function, esthetics, and comfort for patients. Implant treatment protocols have been improved relative to implant macro- and micro-geometries, surgical and prosthetic components, and treatment times. Over the past 20 years, immediate occlusal function (also known as loading) has been established as a predictable treatment modality, provided certain specific criteria are met. In many cases, edentulous patients, crippled by the loss of their teeth, can undergo outpatient surgical and prosthetic procedures and return to a masticatory function that is near normal—sometimes after only one day of surgical and prosthetic treatment. This treatment option is also available for patients with advanced, generalized periodontal disease.

Computer-assisted design/computer-assisted manufacturing (CAD/CAM) has transformed how dental prostheses are made, offering improved accuracy, longevity, and biocompatibility; along with reduced labor costs and fewer complications than casting technologies.

This article reviews the principles associated with immediate occlusal loading and illustrates one specific accelerated prosthodontic treatment protocol used to treat edentulous and partially edentulous patients with interim and definitive prostheses.

Received: May 31, 2012
Accepted: July 2, 2012

Originally, osseointegration was designed for edentulous patients, specifically those patients with edentulous mandibles who had difficulty managing mandibular complete dentures.1 Lindquist et al recorded high implant cumulative survival rates (CSRs) with two-stage surgical protocols where implants were placed and soft tissues were closed.2 During initial healing, implants were not exposed in the oral cavity. Initially, four to six months of unloaded healing was necessary for osseointegration prior to a second surgical procedure. This second procedure was scheduled to uncover the implants, place trans-mucosal abutments and begin prosthetic procedures. Unfortunately, patients generally had to continue wearing ill-fitting dentures during this entire time. Ironically, patients generally scheduled this type of treatment because of trouble managing their mandibular dentures, yet the fixed implant prostheses were not placed until 9-12 months after implant placement.

The literature has demonstrated high survival rates for implants placed (with high primary stability) into the parasymphysis regions of edentulous mandibles, splinted together with some type of rigid interim prostheses, and placed into immediate functional occlusion.2-6 This modality also may be considered for partially edentulous patients with severe periodontal disease.7 In a 2002 study, Cooper et al placed mandibular implants with high primary stability immediately after extraction of periodontally compromised teeth.7 These implants were rigidly splinted together with acrylic resin prostheses, and placed into fully functional occlusion. At evaluations 6 to 18 months after placement, the implants demonstrated a CSR of 100%.7

Buser et al and Cochrane et al considered implants to be successful if they satisfied the following criteria:

• Absence of pain or any negative subjective sensation
• Absence of clinically detectable implant mobility
• Absence of any recurrent peri-implant mucositis and/or peri-implantitis accompanied by swelling, redness, or pain of the peri-implant mucosa
• Absence of continuous peri-implant radiolucency
• Absence of mesial and/or distal vertical bone loss of more than 30% of the endosseous part of the implants
• No need to repair or replace the implant-supported prosthesis
• Subjective evaluation of the treatment outcomes

The average number of implants required for implant prostheses has been discussed in the literature.
In a retrospective chart review, Strietzel et al reported that nine was the median number of implants required for maxillary fixed implant prostheses (SD = 1.6; range = 6-12), compared to eight implants for mandibular fixed prostheses (SD = 1.4; range = 6-10). These findings were similar to those published by Del Fabbro et al in 2006. In 2007, Capelli et al studied immediate occlusal loading in maxillary and mandibular jaws: the implant CSR for the maxilla was 97.6% for up to 40 months post-loading, no implant failures were reported for the mandible; the prosthesis CSR was 100%. These results indicated that immediately loaded tilted implants achieved the same outcome as upright implants in both jaws, suggesting that immediate rehabilitation of edentulous maxillae and mandibles with hybrid prostheses (supported by six or four implants, respectively) may represent a viable treatment alternative compared to more demanding surgical procedures, such as grafting.

A 2010 clinical study by Agliardi et al followed 173 edentulous patients for up to 59 months. Four implants (two tilted, two vertical), were placed according to a specific protocol (All-on-4, Nobel Biocare). Provisional, all-acrylic resin prostheses and implants were inserted on the same day, with definitive prostheses inserted four to six months later. A total of 154 immediately loaded prostheses (61 maxillary, 93 mandibular) functioned for at least one year and were included in the analysis. Four vertical maxillary and one tilted mandibular implant failed within six months of occlusal loading; no further implant failures were noted. At one year, the CSR was 98.4% for maxillary implants compared with 99.7% for mandibular implants. The authors concluded that the All-on-4 protocol can be considered a viable treatment option for immediate rehabilitation of both the mandible and maxilla.

These studies reported consistent clinical results associated with immediate, interim, acrylic resin prostheses. The treatment approach required fabricating two prostheses: interim acrylic resin prostheses (made and inserted within one to two days of implant placement) and definitive prostheses (fabricated with metal frameworks approximately three to six months after implant placement and occlusal loading). Other protocols provide patients with definitive cast metal frameworks/hybrid prostheses within 3-5 days of implant placement. These protocols involve slightly more coordination among the surgical, prosthetic, and laboratory teams, but have proven to be a viable alternative to previous protocols that included interim and definitive prostheses.

**CAD/CAM frameworks**

Recent years have seen continued developments related to the fabrication of implant frameworks and abutments. Complex castings involving multiple units are difficult to fabricate with passive, accurate fits. There are multiple reasons why conventional castings do not result in accurate fitting frameworks, including the expansion/contraction of materials (such as impression materials, dental stones, wax, and casting investments). Mitha et al studied titanium implant frameworks cast with the lost wax technique and found vertical gaps in both wax patterns and castings. Significant differences were found in distortion between wax patterns and castings, which, given the authors’ criteria for the standard of fit to keep within 150 µ of misfit for passivity, were larger than the wax frameworks by between 416 and 477 µ. The authors concluded that conventionally cast titanium frameworks probably could not be made to the degree of accuracy required to fit passively on abutments because of the multiple variables inherent in casting processes.

By contrast, a 2008 study by Tan et al reported that waxing and casting using the lost wax technique resulted in smaller vertical marginal gaps between restorations and abutments (23.91 ± 9.80 µ) than the CAD/CAM process (79.43 ± 25.46 µ). However, it should be noted that these results referred to individual, single-unit restorations rather than multiple-unit implant frameworks.

In a 2010 laboratory study, Drago et al determined that CAD/CAM implant frameworks supported by five mandibular implants fit significantly better than cast frameworks made on the same patient models. That same year, Eliasson et al measured milled titanium implant frameworks for two different implant systems, concluding that all the frameworks presented signs of misfit, no framework actually demonstrated a “passive” fit, and clinical frameworks had greater misfits than frameworks fabricated in laboratory studies. The authors reported that all the frameworks in their study demonstrated levels of precision of fit within clinically acceptable limits.

In 2012, Ortorp & Jemt followed 126 edentulous patients for whom 67 prostheses with CAD/CAM titanium frameworks (test) had been provided (in 23 maxillae and 44 mandibles), while 62 prostheses fabricated with gold-alloy castings (control) were placed in 31 maxillae and 31 mandibles. Clinical and radiographic 10-year data were collected and statistically compared. At 10 years, the prostheses
demonstrated a 95.6% CSR for the CAD/CAM group compared to 98.3% for the gold-alloy castings group; implants demonstrated a 95.0% CSR for the CAD/CAM group compared with 97.9% for the control group (*P* > 0.05). No implants were lost after five years of follow-up; however, one prosthesis in each group was lost due to implant loss, one CAD/CAM prosthesis failed due to framework fracture, and two metal fractures were registered in each group. The authors also identified that maxillary prostheses required more maintenance appointments than mandibular prostheses (*P* < 0.001).20

## Case report

A 45-year-old woman sought treatment with the chief complaint of “loose teeth” in need of repair (Fig. 1). The patient had not seen a dentist in over 15 years and did not want to wear dentures. A complete physical and radiographic examination revealed localized, acute, severe periodontitis (type IV); partially edentulous maxillae and mandible; and Class II malocclusion with poor anterior guidance.

When the teeth were determined to be non-restorable, two treatment options were offered to the patient: One involved an immediate loading protocol with extraction of the teeth, placement of implants and insertion of full arch prostheses on the day of implant placement. The definitive treatment included prostheses with CAD/CAM frameworks approximately 4-6 months later. The second option included extraction of the teeth and insertion of immediate complete dentures. If the patient could not adapt to the dentures, implants would then be considered for definitive treatment (see Table 1). After discussing the benefits and limitations of each, the patient decided to proceed with the first treatment option (see Table 2).

### Table 1. Treatment plan options presented to the patient at the consultation appointment.

<table>
<thead>
<tr>
<th>Treatment plan No. 1</th>
<th>Treatment plan No. 2</th>
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</thead>
<tbody>
<tr>
<td>Extraction, alveolectomy, implant placement, immediate occlusal presented loading</td>
<td>Extractions, alveolectomy, insertion of immediate complete dentures</td>
</tr>
<tr>
<td>with full arch, fixed interim prostheses at new vertical dimension of occlusion</td>
<td></td>
</tr>
<tr>
<td>Follow-up and osseointegration of dental implants</td>
<td>Tissue conditioning of immediate complete dentures</td>
</tr>
<tr>
<td>Evaluation of osseointegration, vertical dimension, centric occlusion, phonetics,</td>
<td>Evaluation of retention, stability, function, esthetics and phonetics. Determination</td>
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<tr>
<td>and esthetics</td>
<td>of definitive treatment plan: conventional or implant supported/retained prostheses</td>
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<tr>
<td>Fabrication of definitive prostheses with CAD/CAM frameworks</td>
<td>Determination of fixed or removable implant supported/retained prostheses: Implant</td>
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<tr>
<td></td>
<td>placement with or without immediate occlusal loading</td>
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<tr>
<td>Follow-up care</td>
<td>Fabrication of definitive conventional or implant supported/retained prostheses</td>
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</table>

The patient’s dentition was restored using an accelerated prosthetic treatment protocol that utilized definitive screw-retained hybrid prostheses made with CAD/CAM technology.

### Accelerated treatment protocol: Initial diagnostic phase

To facilitate treatment, all necessary prosthodontic procedures—preliminary impressions for diagnostic casts, jaw relation records (including facebow and centric jaw relation records), shade selection, and initial determination of the new vertical dimension of occlusion...
and positions of the teeth—were performed in one day, based on discussions with the patient relative to her wishes. (The actual procedures will not be described here in detail; numerous sources are available for learning step-by-step instructions.)

The casts were mounted in an average value articulator (Stratos 100, Ivoclar Vivadent). The tentative location of the new mandibular incisal edge position was marked on the diagnostic cast; the posterior location of the occlusal plane was located at approximately two-thirds of the vertical height of the retromolar pad (Fig. 2). The incisal guide pin was raised approximately 8 mm from the original vertical dimension of occlusion (VDO); this developed the restorative space required to place the teeth in their correct positions. The patient did not want to see the maxillary incisal edges while at rest; however, she did wish to see 50% to 66% of the maxillary incisors when she smiled. The teeth were removed from the maxillary cast, along with additional stone that corresponded to a restorative volume of approximately 12-15 mm. The author measures restorative volume as the space from the crest of the alveolar ridge to the location of the maxillary central incisor incisal edge (Fig. 3). Maxillary and mandibular

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Table 2. Benefits and limitations of the two treatment options presented to the patient.

<table>
<thead>
<tr>
<th>Treatment plan No. 1: Immediate occlusal loading</th>
<th>Treatment plan No. 2: Complete dentures</th>
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</thead>
<tbody>
<tr>
<td><strong>Benefits</strong></td>
<td><strong>Benefits</strong></td>
</tr>
<tr>
<td>Patient never has to wear complete dentures</td>
<td>Less invasive surgery</td>
</tr>
<tr>
<td>Fixed, non-removable prosthesis</td>
<td>Less technique-sensitive</td>
</tr>
<tr>
<td>No palatal coverage</td>
<td>Removable dentures with palatal coverage</td>
</tr>
<tr>
<td>Minimal long-term bone loss</td>
<td><strong>Limitations</strong></td>
</tr>
<tr>
<td>Improved masticatory function</td>
<td>Decreased expense</td>
</tr>
<tr>
<td>Long-term history of documented success</td>
<td>Bone resorption continues beneath the dentures</td>
</tr>
<tr>
<td><strong>Optimal esthetics</strong></td>
<td></td>
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</table>

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denture teeth (Mondial, Heraeus Kulzer) were set in Class I occlusion with a horizontal occlusal plane. Group function was developed for right and left working movements and the prostheses were processed and polished (Fig. 4).

**Accelerated treatment protocol: Second treatment phase (surgery and conversion of the interim prostheses)**

The patient was sitting upright with her head unsupported. Prior to anesthesia and sedation, dots were placed on the patient’s nose and chin with an indelible marker (Sanitary Color Transfer Applicators, Great Plains Dental). The marks were transferred to a wooden cotton applicator; the middle mark represented the planned location of the maxillary central incisal edges in the interim prosthesis; the lower dot was transferred consistent with the tentative increase in the vertical dimension of occlusion planned for the new prostheses (Fig. 5). At that point, the patient was sedated and prepared for maxillary surgery. The maxillary teeth were removed, a full thickness mucoperiosteal flap was elevated, and an alveolecotomy was performed that provided 12-15 mm of restorative volume between the alveolar crest and the planned locations of the maxillary central incisal edges (Fig. 6). The maxillary canines and lateral incisor segments had been removed from the interim prosthesis, which allowed the surgeon complete visual access relative to restorative volume and anterior/posterior implant positioning. Visual access could also have been accomplished with a clear surgical duplicate of the interim prosthesis.

Implants were placed (NobelActive, Nobel Biocare) with insertion torques in excess of 70 Ncm as measured on a manual torque....
driver. The two distal, tilted implants were placed parallel to the anterior walls of the maxillary sinuses; the anterior implants were placed relatively vertical in the lateral incisor areas. Straight internal connection conical abutments were placed on the anterior implants (with abutment screws torqued to 35 Ncm) such that the screw access openings were lingual to the anterior teeth. Next, multi-unit abutments (at 30° angles) were placed on the distal implants so that the screw access openings were located within the occlusal surfaces of the posterior teeth (abutment screws torqued to 15 Ncm) (Fig. 7). The flap was closed with a combination of bone and soft tissue sutures that repositioned the peri-implant soft tissues on and to the alveolar ridge. The patient was discharged to the doctor for the prosthodontic procedures.

Abutment impression copings (Impression Coping Open Tray Multi-unit, Nobel Biocare) were placed onto the abutments. Next, 30-gauge orthodontic wire was sectioned, placed within the concavities of the impression copings and luted with Triad® Gel (Dentsply International) (Fig. 8). The locations of the impression copings were identified and corresponding holes were made in a stock impression tray (Crystal Disposable Impression Trays, Henry Schein Inc.) such that the copings did not touch the tray or splinted impression copings. Polyvinyl siloxane impression material (Impress 3 Quick Step Light Body and Impress 3 Penta Quick Step Heavy Body, 3M ESPE) was used to make the definitive impression. A master cast was fabricated using vacuum-mixed dental stone per the manufacturer's instructions (Coe Cal, GC America Inc.). Two sections of teeth (canines and lateral incisors) were removed from the maxillary prosthesis prior to the surgical phase of treatment; this facilitated complete visualization of the temporary cylinders relative to the denture base. Metal temporary abutment cylinders (Temporary Coping Multi-unit Titanium, Nobel Biocare) were placed on the two anterior implants. The maxillary prosthesis was adjusted to fit around the cylinders; the dental midline was made to be consistent with the facial midline. In order to consistently seat the prosthesis in its correct position, quick setting polyvinyl siloxane impression material (Impress 3 Quick Step Light Body, 3M ESPE), was injected onto the intaglio surface of the maxillary prosthesis; the prosthesis was seated paying careful attention to the dental midline, occlusal plane, and anterior/posterior positioning (Fig. 9). After the stabilizing impression was removed, a rubber dam was cut and placed onto the anterior temporary cylinders; at that point, the prosthesis was re-seated, with careful attention paid to the facial midline, orientation of the occlusal plane, and lip support. While the author held the prosthesis in position, a dental assistant injected autopolymerizing resin (Secure Hard Pick-Up Material, 3M ESPE) around the cylinders to completely attach them to the denture base. The resin set and the prosthesis were removed (Fig. 10).

Locations of the posterior abutments were identified in the stabilizing impression. In the laboratory, holes were drilled through the denture base and the Mondial posterior denture teeth. Using laboratory

![Fig. 8. Clinical image of abutment impression copings in place; light cure composite resin was used to initially hold orthodontic wire segments in place on each impression coping. These impression copings were designed with concavities that hold the orthodontic wire segments in place during this procedure.](image)

![Fig. 9. The intaglio surface of the maxillary stabilizing impression.](image)
screws, the denture base was seated on the two anterior cylinders and the base was adjusted so that no part of the denture base touched the master cast (Fig. 11). Metal, multi-unit temporary cylinders were placed onto the posterior abutment analogs and the anterior metal temporary cylinders were re-positioned onto the master cast with laboratory screws. The maxillary interim prosthesis was placed (with the mandibular interim prosthesis) into Class I occlusion, so that the tooth segments were re-oriented into their proper positions. Secure Hard Pick-Up Material was used to attach the posterior cylinders and anterior tooth segments to the denture base. The prosthesis was contoured, finished, and polished for use as the maxillary interim prosthesis (Fig. 12).

By this time, the surgeon had anesthetized the patient’s mandible, removed the teeth, and started the alveolectomy. The surgeon placed the completed, maxillary interim prosthesis onto the anterior abutments with retaining screws and attached the mandibular prosthesis to the maxillary prosthesis by using posterior vertical ball clasps (Ball Clasps .032, Henry Schein Inc.) (Fig. 13). The ball clasps were attached to the posterior portions of the mandibular denture base after processing. To retain the ball clasps into the maxillary prosthesis, two corresponding concavities were placed into the posterior portions of the maxillary denture base. This facilitated treatment by eliminating the need for an interocclusal record to orient the mandibular prosthesis to the maxillary prosthesis. The surgeon was free to concentrate on obtaining the correct jaw position relative to the prostheses and judge the amount of restorative volume created by the mandibular alveolectomy. The doctor used 12-15 mm as the baseline for the total restorative volume. Restorative volume must take into account abutment and cylinder heights, as well as the thickness of the denture base for strength and rigidity. The surgeon completed the alveolectomy, placed four mandibular implants (with insertion torques of at least 70 Ncm) and sutured the flap. The two distal implants were tilted; the two anterior implants were relatively vertical. This arrangement provided a clinically acceptable anterior/posterior spread. The canine and lateral incisor segments were removed from the mandibular prosthesis before mandibular clinical procedures were performed. Removing the denture teeth from the denture base made it possible to visualize implant placement relative to tooth locations within the interim prosthesis.

Fig. 10. The intaglio surface of the interim screw-retained prosthesis.

Fig. 11. The maxillary interim prosthesis in place on the master cast.

Fig. 12. The occlusal surface of the completed maxillary interim prosthesis.

Fig. 13. Left: The mandibular interim prosthesis with two sets of ball clasps luted to the denture base in the right and left posterior segments. Right: The ball clasps retain the mandibular prosthesis to the maxillary prosthesis in a Class I occlusal relationship. Concavities (using a 6 round bur) were placed into the maxillary denture base to retain the ball clasps.
The mandibular procedures duplicated the maxillary procedures as described above with one exception: The anterior cylinders and the mandibular denture base were connected with the mandibular prosthesis attached to the maxillary prosthesis via posterior ball clasps. As a result, the doctor only had to concentrate on maintaining the correct jaw position (Fig. 14); to make sure the VDO was consistent, this position was checked against the cotton tip applicator and the marks on the nose and chin. The mandibular prosthesis was removed and the conversion to the interim prosthesis was completed in the laboratory (including removal of the ball clasps from the denture base). The mandibular prosthesis went into place with prosthetic screws torqued to 15 Ncm and the access opening restorations were completed with light cure resin. The patient left the office approximately seven hours after arriving. She now had two fixed, implant-retained interim prostheses in Class I occlusion, at an appropriate VDO with improved esthetics (Fig. 15). One of the primary benefits of immediate occlusal loading is that patients never have to go through an edentulous stage wearing complete dentures.

Accelerated treatment protocol: Third treatment phase (definitive prostheses)

Osseointegration occurred uneventfully. Approximately four months after extraction, implant placement, and immediate occlusal loading, the patient was ready to receive the definitive prostheses. (During this time, the patient had a hemangioma removed from her upper right lip.) The patient was questioned about the esthetics, tooth display, lip support, phonetics, and hygiene allowed by the interim prosthesis. The patient was very pleased with the results of the interim prostheses and basically wanted no changes for the definitive prostheses.

The traditional prosthodontic protocol typically includes some combination of the following: preliminary impressions for construction of custom impression trays, definitive impressions, verification index, initial jaw relation records, wax try-in, metal framework try-in, wax try-in with teeth on the frameworks, and insertion. These procedures typically require up to eight separate visits; however, the accelerated treatment protocol used in this case combined all of the above visits into three appointments (see Table 3).

Table 3. Treatments performed at each appointment for fabrication of the definitive prostheses with CAD/CAM frameworks, using the accelerated treatment protocol.

<table>
<thead>
<tr>
<th>Appointment No. 1</th>
<th>Evaluation of esthetics, jaw relation records (facebow and centric jaw relation records).</th>
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<tbody>
<tr>
<td></td>
<td>Abutment level impression using the interim prostheses as the verification indexes.</td>
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<tr>
<td></td>
<td>Articulator mounting of the master casts (with the interim prostheses).</td>
</tr>
<tr>
<td></td>
<td>Mounted diagnostic casts of the interim prostheses (cross-mounted against the interim prostheses and master casts).</td>
</tr>
<tr>
<td></td>
<td>Wax dentures were set in the laboratory, with plastic temporary cylinders.</td>
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<tr>
<td></td>
<td>Optimal tooth positions and jaw relations were transferred to the master casts via cross mounting the casts of the interim prostheses.</td>
</tr>
<tr>
<td></td>
<td>The wax dentures and master casts were then sent to a milling center for fabrication of the CAD/CAM frameworks.</td>
</tr>
<tr>
<td>Appointment No. 2</td>
<td>Framework and wax try-in, evaluation of the esthetic results and jaw relation records, remount mandibular cast (if needed), and second wax denture setup for esthetic modifications per patient request (if needed).</td>
</tr>
<tr>
<td></td>
<td>Insertion of interim prostheses.</td>
</tr>
<tr>
<td>Appointment No. 3</td>
<td>Insertion of definitive prostheses.</td>
</tr>
</tbody>
</table>
Appointment No. 1
The patient was extremely pleased with the results of treatment and did not want any changes made to the definitive prostheses. Prior to removing the interim prostheses, facebow and jaw relation records were made at the existing VDO; the dental midline was consistent with the facial midline and was so recorded. The interim prostheses were removed. The peri-implant soft tissues were healthy, and abutments and implants were stable (Fig. 16). The interim prostheses passed the one-screw test for passivity; the interim prostheses was contained within the impression as the verification index. Long impression coping screws were used to seat the interim prostheses/verification indexes onto the abutments. A Crystal Disposable Impression Tray was adjusted to fit around the screws for use with the open tray technique when making the impressions. To make the definitive impressions, Imprint 3 Quick Step Light Body was used in, under, and around the prostheses, while Imprint 3 Penta Quick Step Heavy Body was used in the tray (Fig. 17). The impressions were poured to fabricate master casts.

After the dental stone had set, the master casts (with the interim prostheses in place) were mounted in the Stratos 100, using the facebow and centric jaw relation records (Fig. 18). A diagnostic cast of the maxillary interim prostheses was mounted with the centric jaw relation record against the mandibular interim prosthesis/master cast, while a diagnostic cast of the mandibular interim prosthesis was mounted with the centric
jaw relation record against the maxillary interim prosthesis/master cast. This step allowed the dental laboratory technician to set denture teeth for the CAD/CAM prostheses without forcing the patient to wait. The interim prostheses were returned to the patient, who was discharged. These procedures took approximately two hours of chairtime.

Temporary Coping Multi-unit plastic cylinders were placed onto the abutment analogs in the master casts (Fig. 19), and Mondial teeth (of the appropriate size and shade) were set against the casts of the respective interim prostheses (Fig. 20). Since the patient wished to maintain the esthetics of the interim prostheses, a clinical try-in was not needed, as the denture setup was to be used only to design the frameworks. The wax dentures were finished and sent to an implant milling center to design and mill the CAD/CAM frameworks (Bella Tek CAM StructSURE Precision Milled Bars, Biomet 3i). The wax dentures and master casts were scanned and frameworks were designed and milled (Fig. 21).

The frameworks were returned to the doctor; at that point, the denture teeth were removed from the scanned, wax dentures and set on the frames (using the cross-mounted diagnostic casts described in Table 3) prior to the next clinical appointment. The occlusion was developed as bilateral Class I, with group function in right and left working movement. Anterior guidance was developed as anterior disclusion with the central and lateral incisors.

**Appointment No. 2**

At the second appointment, the interim prostheses were removed and abutments and implants were stable. The frameworks (with denture teeth) were tried in and both frameworks passed the one-screw test. The jaw relationships were confirmed. The patient had a thorough chance to evaluate the esthetics of the definitive prostheses (Fig. 22); she was pleased with the esthetic results and wanted no changes. The wax prostheses were removed and the interim prostheses were reinserted. The patient was discharged and scheduled to return for insertion of the definitive prostheses. The appointment lasted approximately one hour.

**Appointment No. 3**

At this appointment, the interim prostheses were removed, and the abutment screws were re-torqued (15 Ncm for the angled posterior abutments; 35 Ncm for the straight anterior abutments). Initially, the definitive prostheses were placed with laboratory try-in screws; even occlusal contacts were established throughout the prostheses. Group function was developed for right and left working movements, while anterior guidance was established with the incisors. The prostheses were removed and denture bases were finished and polished. They went back into place with new prosthetic screws, torqued to 15 Ncm. Access openings were blocked out with cotton and restored with light cured composite resin. The patient was very pleased with the esthetic
results and was discharged with written and verbal post-operative instructions (Fig. 23). This appointment took approximately one hour.

Summary
Numerous short- and long-term clinical studies, using multiple implant systems, have documented successful cases involving immediate occlusal loading with full arch, fixed prostheses. The keys for successful clinical treatment include thorough radiographic and physical examinations, accurate diagnoses and careful, complete treatment planning. Ideally, treatment planning should involve surgical, prosthodontic, and laboratory personnel. All clinicians need to be involved to obtain optimal, consistent restorative volumes during the surgical phases of treatment. The author recommends making 12-15 mm of vertical space available for implant restorative components and prostheses to ensure that the tooth positions and strength of the prostheses will not be compromised. High implant placement insertion torque values (at least 50 Ncm) are needed for implant primary stability prior to fabricating fixed, interim prostheses and immediate occlusal loading. Fabrication of interim prostheses follows the basic prosthodontic principles associated with conventional and immediate dentures in determining the location of teeth, orientation of the occlusal plane, esthetics, phonetics, vertical dimension of occlusion, and lip support. Once osseointegration has been achieved, definitive prostheses can be constructed. The best material to use for this process involves CAD/CAM technology to mill titanium alloy frameworks and combines multiple short prosthodontic visits into fewer, longer visits that, in the author’s experience, have proven to be more efficient in clinical practice (and better received by patients) than conventional appointment scheduling with multiple, shorter appointments. That is not to say that the more conventional methods of performing these treatments are incorrect; rather the treatment described in this article is simply quicker and more patient-friendly.

Dental implant treatment will continue to evolve in terms of materials, procedures, protocols, and so forth. The accelerated treatment protocol illustrated in this article is one group practice’s adaptation to the continued evolution of dental implant therapy.

Disclaimer
The author has no financial, economic, commercial, and/or professional interests related to topics or products presented in this manuscript.

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