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implants

the international C.E. magazine of oral implantology

1 2013

_c.e. article
Utilizing the Tempcap abutment with CAD/CAM

_events
Academy of Osseointegration heads to Tampa

_industry
Implant position in the esthetic zone

Stay on top of new techniques, products with *implants*

Publisher Torsten Oemus

_Thanks to rapidly advancing technology, the field of implant dentistry is always changing and evolving. Clinicians must be vigilant in their efforts to keep up with new techniques, new products and new technology that could affect treatment planning.

And that's what makes the publication you are holding right now so valuable.

For this issue of *implants*, we've assembled a collection of articles from a variety of respected names and companies in dentistry. These expert clinicians are sharing their first-hand knowledge and expertise with you. In this issue, you can read about utilizing the Tempcap abutment with CAD/CAM, and you can also learn about the lateral antrostomy technique for maxillary sinus augmentation. We also have news on implant events and products.

But there's more.

Every issue of *implants* magazine also contains a C.E. component. By reading the set of articles (beginning on Page 6) on "Utilizing the Tempcap abutment with CAD/CAM" by Dr. Kalman and "Lateral antrostomy technique for maxillary sinus augmentation" by Drs. Batal and Norris and then taking short online quizzes about these articles at *www.DTStudyClub.com*, you will gain one ADA CERP-certified C.E. credit.

Keep in mind that because *implants* is a quarterly magazine, you can actually chisel ***at least*** four C.E. credits per year out of your already busy life without any more lost revenue and time away from your practice.

To learn more about how you can take advantage of this C.E. opportunity, visit *www.DTStudyClub.com*. Annual subscribers to the magazine ($50) need only register at the Dental Tribune Study Club website to access these C.E. materials free of charge. Non-subscribers may take the C.E. quiz after registering on the DT Study Club website and paying a nominal fee.

I know that taking time away from your practice to pursue C.E. credits is costly in terms of lost revenue and time, and that is another reason *implants* is such a valuable publication.

I hope you enjoy this issue and that you get the most out of it.

Sincerely,

Torsten Oemus
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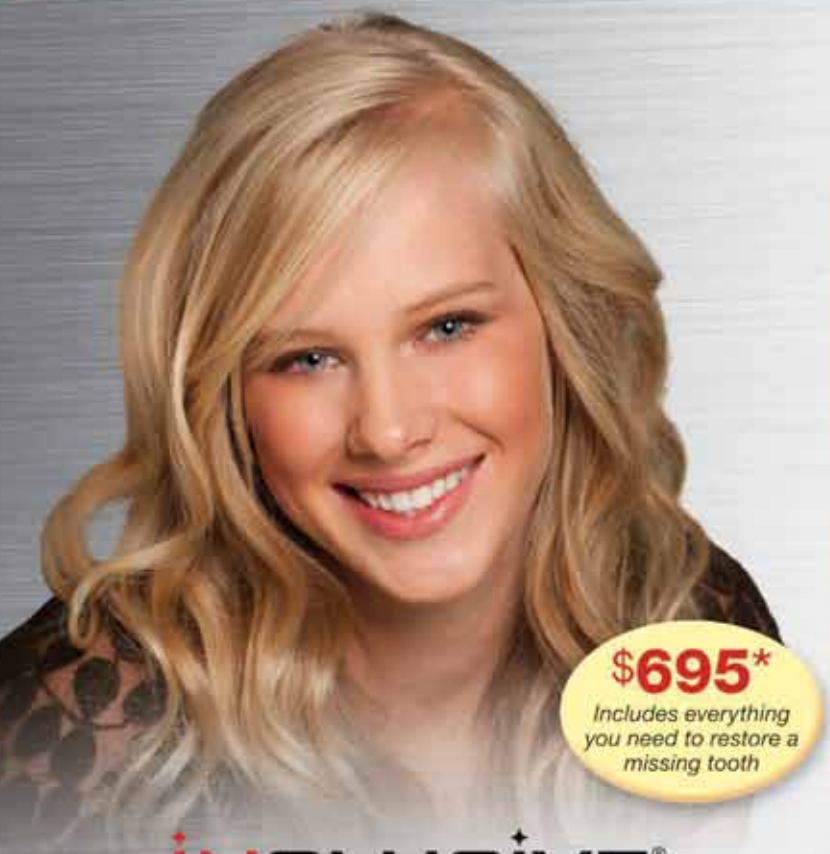

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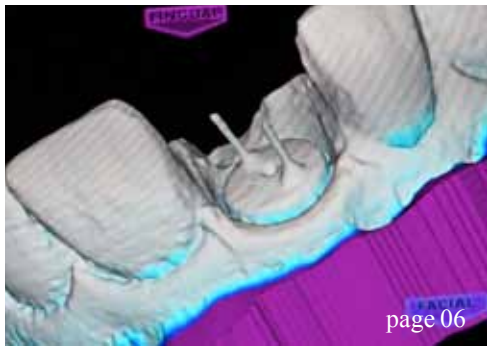
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Utilizing the Tempcap abutment with CAD/CAM

Author_Les Kalman, DDS

_c.e. credit part I

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Combination of Tempcap, in-office CAD/CAM and e.max allows for final restoration

_Abstract

The E4D in-office CAD/CAM unit has been employed in an investigative laboratory study to design and mill an unconventional IPS e.max restoration that would be coupled with the Tempcap as a final implant-supported crown. The combination of the Tempcap, in-office CAD/CAM procedures and e.max allows the clinician to create an immediate final restorative product with ideal characteristics.

The procedure is a simple, efficient and effective solution for the restoration of implants.

_Introduction

The temporization of a dental implant following surgery, particularly in the anterior region, is a necessary procedure. The temporization allows for surgical healing, preservation of the gingival architecture and, most important, replacement of a tooth in the edentulous space for patient acceptance. Several techniques for the temporization exist, but the process has proved to be time-consuming and frustrating. The Tempcap abutment and the process for temporization were created to provide a simple yet effective approach.[1] With the advent of CAD/CAM technology and e.max, the potential of the Tempcap to act as a final abutment seemed likely and suitable for investigation.

_Background

Following the surgical placement of a dental implant, several requirements must be met to maxi-

Fig. 1_Tempcap abutment.

Fig. 2_ Retentive pins.

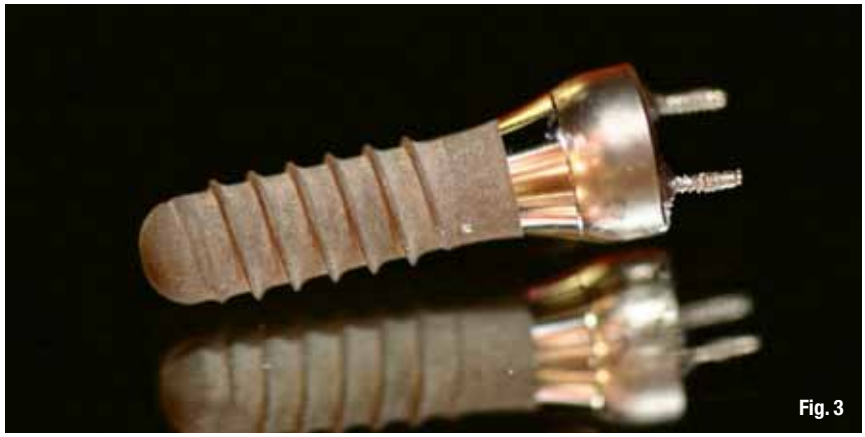
Fig. 3


Fig. 4

mize healing and osseointegration of the implant body to bone:

- Minimal forces, if any, should be exerted on the implant body, permitting proper healing and preventing a non-osseous union.[2]
- The gingival architecture must be managed meticulously to prevent contamination, minimizing the risk of peri-implantitis and possible failure.[3]
- There must be sufficient time for the process of osseointegration.[4]
- Temporization and immediate restorations should not violate these factors.[5]

The Tempcap (Research Driven, Ontario, Canada) is a healing cap and restorative platform combined (Fig. 1). It has an all-metal construction, and it contains two to three retentive pin projections (Fig. 2). Tempcap is available in different widths and heights to accommodate different implant sizes (Fig. 3) and is compatible with existing instrumentation (Figs. 4).

The function of the Tempcap is:

- to allow for optimal gingival healing
- prevent contamination of the surgical field
- minimize forces and micro-vibrations on the implant
- facilitate the simple yet successful restoration of the implant (Fig. 5).

CAD/CAM stands for computer-aided design and computer-aided manufacturing. CAD enables the individual to digitally capture an image of a prepared tooth or structure and then design an indirect (out of the mouth) restoration by using software.[6]

After the ideal restoration has been produced, the design is then fabricated out of a material by a milling machine. In-office E4D units (D4D Technologies) are currently available to allow for immediate chairside fabrication without the use of a commercial laboratory.

IPS e.max (Ivoclar Vivadent) is a relatively new metal-free dental material used in indirect restorations. It is an esthetic material composed of lithium disilicate and has ideal physical and esthetic properties, allowing it to be the first choice for CAD/CAM restorations. IPS e.max has strength second only to gold and has the ability of detailed CAM production.[7]

_Methodology

The Tempcap was selected and placed on an Ankylos (DENTSPLY) implant body (master cast with soft tissue) (Fig. 6). Digitization was achieved by using an E4D camera (Fig. 7), in which several images were captured to compile an accurate image (Figs. 8 and 9). CAD design was used with E4D software to determine and delineate margins (Fig. 10).

Fig. 3_ Tempcap with Straumann implant.

Fig. 4_ Use of existing instruments.

Fig. 5_ Temporization form and function.

Fig. 6_ Tempcap on soft-tissue model with Ankylos implant.


Fig. 5


Fig. 6


Fig. 7

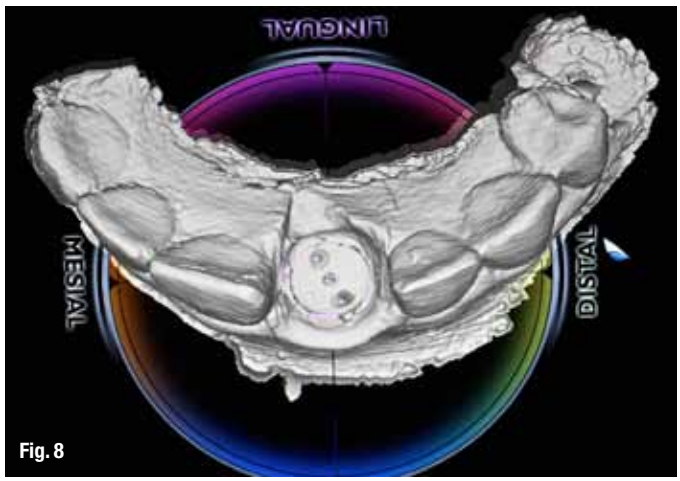

Fig. 8

Fig. 9

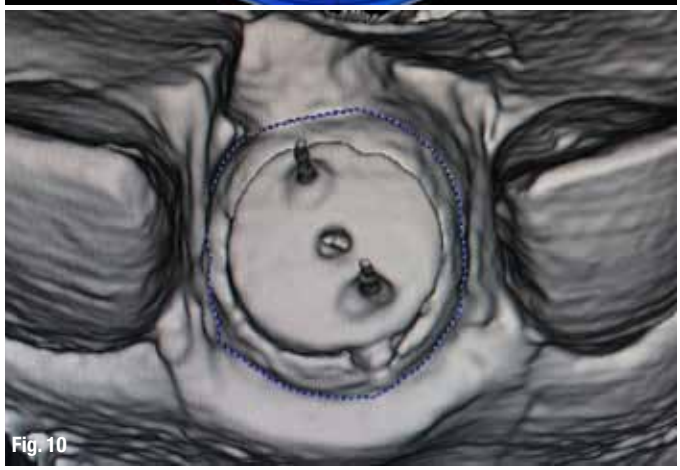
Fig. 10


Fig. 11

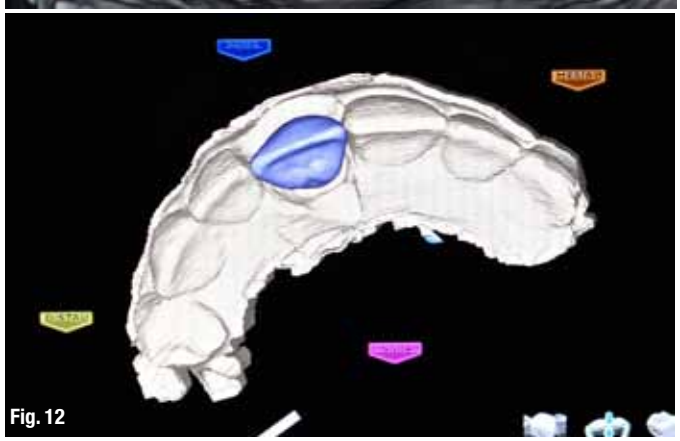
Fig. 12

Fig. 7_Digitization with E4D camera.
Fig. 8_ Digitized images of arch.
Fig. 9_ Tempcap digitized.
Fig. 10_Digitized delineation of Tempcap.
Fig. 11_Development of emergence profile.
Fig. 12_Occlusal view of restoration.

Tooth design was initiated incorporating several parameters:

- ideal esthetics and emergence profile (Fig. 11)
- adequate proximal contacts
- appropriate occlusal scheme
- material thickness requirements
- internal surface morphology to adapt to Tempcap
- design that can be milled via CAM technology

Numerous design iterations were required to achieve the desired design requirements (Figs. 12-14). IPS e.max was selected for milling (Fig. 15) and was executed by an E4D CAM unit (Fig. 16). Milling limitations, such as bur contact and prosthesis fracture, required CAD design modifications. Reiterations in CAD/CAM design were carried out until a successful restoration was achieved (Fig. 17).

The unfired IPS e.max crown was tried for fit and esthetics and then subsequently fired (Fig. 18), resulting in its color change. The crown was further stained, glazed and fired (Fig. 19), resulting in a highly esthetic final restoration (Fig. 20). The restoration's internal aspect (Fig. 21) was assessed

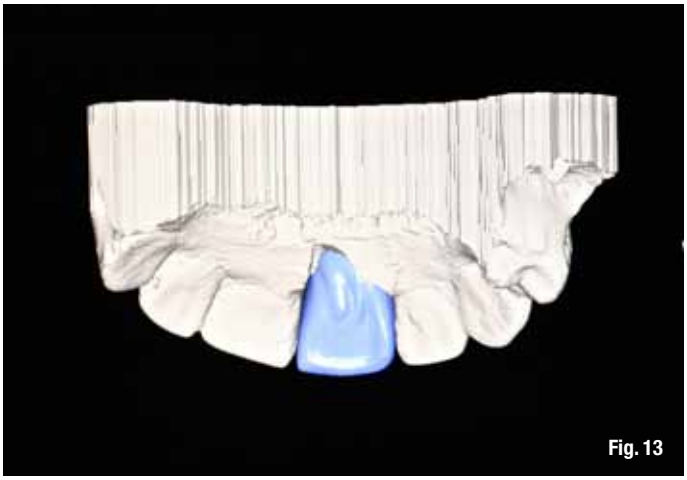
Fig. 13

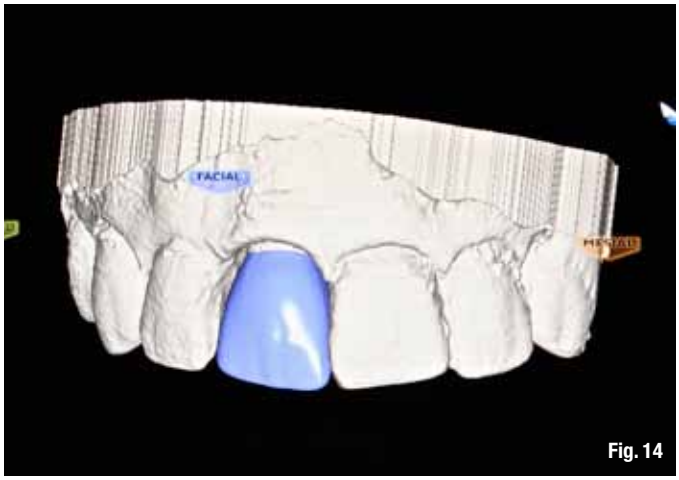

Fig. 14

Fig. 15


Fig. 16


Fig. 17

Fig. 18

for path of insertion, retention and fit.

The IPS e.max prosthetic crown was further assessed for fit, taking into account marginal fit, occlusion and proximal contacts (Fig. 22).

A secondary investigation utilized a more complex Tempcap to assess the limit of the CAD/CAM unit's capability. A stand-alone Ankylos (DENTSPLY) implant body was coupled with a Tempcap abutment with three retentive pin projections (Fig. 23). The abutment was digitized with the same methodology as described. An IPS e.max crown was executed and assessed (Figs. 24 and 25).

_Discussion

This study has determined that the Tempcap can be successfully and accurately digitized and milled by in-office CAD/CAM technology (D4D Technologies) to create an ideal prosthetic crown from IPS e.max within a laboratory setting. CAD software can be manipulated to generate forms beyond the scope of the unit.

Complex units, such as the three-pronged Tempcap may be successfully designed and milled. IPS e.max has the capability to be milled in com-

Fig. 13_ Lingual view of restoration.

Fig. 14_ Facial view of restoration.

Fig. 15_ IPS e.max CAD/CAD block.

Fig. 16_ D4D E4D CAM unit.

Fig. 17_ Milled IPS e.max restoration.

Fig. 18_ Ivoclar furnace.