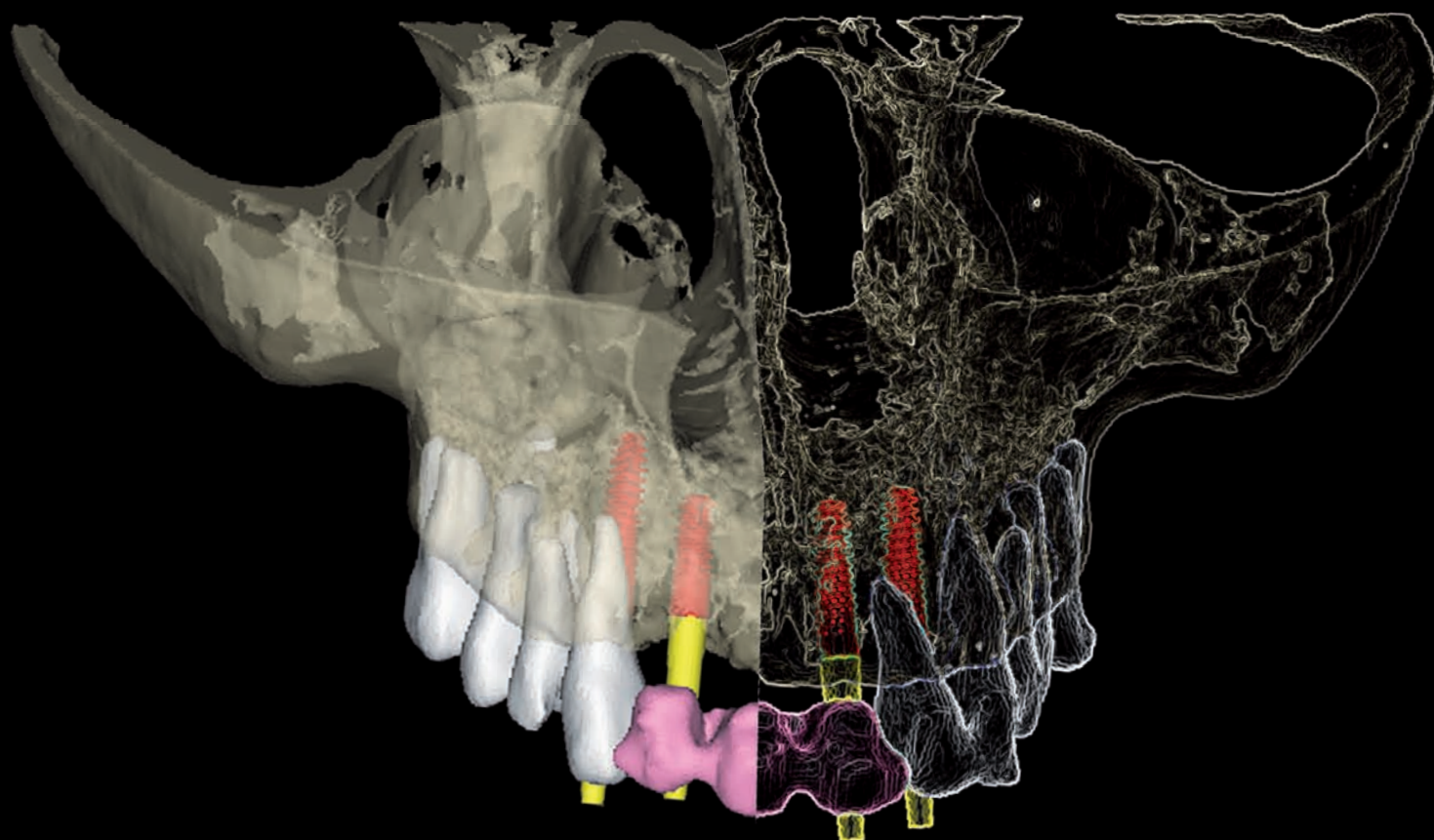


cone beam

international magazine of cone beam dentistry

1 2014



| CE article

Clinical and diagnostics
advantages of 3-D imaging system

| opinion

Adapting CBCT in private practice

| case report

One-visit guided treatment
thanks to CBCT and CAD/CAM

Dental Tribune International

The World's Largest News and Educational Network in Dentistry

dti] Dental
Tribune
International

www.dental-tribune.com



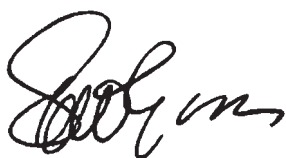
Dear Reader,

I was first exposed to the world of 3-D imaging for dental applications in 1985. At that time, when patients had severely resorbed ridges, and root form implants were just becoming accepted in the US market, subperiosteal implants were a recommended treatment alternative. Conventional subperiosteal implants required two separate surgical procedures, the first for an impression of the alveolar/basal bone for the fabrication of the implant, and the second for the placement of the implant. Each surgical intervention required an invasive and extensive flap to expose the underlying bone. With the inception of CT, a scan of a patient's jawbone created a 3-D dataset that would allow for the fabrication of a physical resin-based medical model. From this model, the subperiosteal implant could be designed and fabricated, circumventing the need for the first surgical procedure reducing patient morbidity by 50 per cent. Of course, the slice thickness and resolution did not result in a high degree of accuracy, and often the implants did not fit well. However, this original application motivated me to find improved solutions with the evolving applications of 3-D imaging modalities and related technology for dentistry.

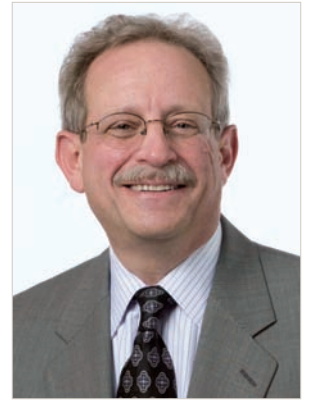
As personal computing power improved, the subsequent development of interactive treatment planning software was able to convert the CT dataset and provide clinicians with new tools to enhance the diagnostic process, a vast improvement over conventional 2-D imaging modalities. The advent of lower-dose CBCT in-office devices provided a significant catalyst for the dental industry to allow for instant access to the technology. Three-dimensional imaging modalities have truly empowered clinicians with an increased visual acuity of individual aspects of patient anatomy for a wide variety of clinical applications. These include but may not be limited to oral surgery procedures, orthodontics, periodontology, endodontics, temporomandibular joint disorders, bone grafting, sleep apnoea, dental implant placement, and reconstruction. The utilisation of CBCT data has been further expanded and augmented with the ability to merge/superimpose cross-platform data from intra-oral and optical scanners for increased diagnostics and to create a direct link to CAD/CAM.

We have come a long way since 1985, but not far enough in my humble opinion. I truly believe that every dental school should not only have a CBCT imaging device, but also be actively integrating the technology into the undergraduate and graduate curriculum, teaching clinicians how to utilise these most powerful tools to provide our patients with the best possible care but without the guess-work.

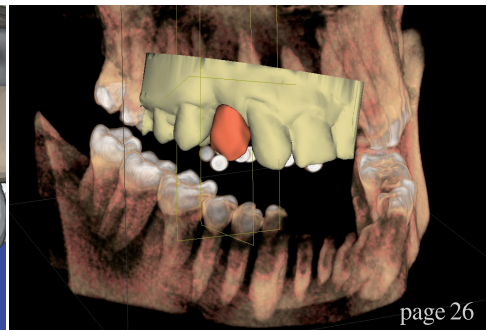
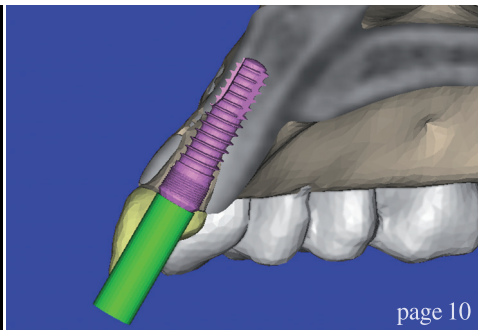
The evolution continues within the pages of our new **cone beam** international magazine. We will do our best to provide our readers with useful information by presenting a variety of clinical applications and state-of-the-art concepts that showcase CBCT technology and related applications. It is time to realize that there is a real danger when we are bound by 2-D concepts, when clearly today we live in a 3-D world. And, as Sir William Osler stated, "What the brain does not know, the eye cannot see."



Dr Scott D. Ganz
Editor-in-Chief



Dr Scott D. Ganz



editorial

- 03 **Dear Reader**
| Dr Scott D. Ganz

CE article

- 06 **Clinical and diagnostics advantages of PreXion 3-D imaging system**
| Dr Dan McEowen, USA

special

- 10 **Dental implantology—
An evolving treatment modality**
| Dr Scott D. Ganz, USA

opinion

- 16 **Prevention of failures in oral implantology**
| Dr Dov M. Almog, USA
- 18 **Adapting CBCT in private practice:
A personal experience**
| Dr Barry Kaplan, USA

industry report

- 22 **coPeriodontiX: Three-dimensional evaluation of circumferential periodontal bone level using cross-sectional CBCT data**
| Drs Jonathan Fleiner, Andres Stricker & Dirk Schulze, Germany

case report

- 26 **One-visit guided treatment thanks to CBCT and CAD/CAM**
| Dr Josef Kunkela, Czech Republic
- 32 **CBCT-assisted implant therapy: A case study**
| Dr Nilesh Parmar, UK
- 36 **CBCT in endodontic treatment of fused second and third mandibular molars**
| Dr Andreas Krokidis, Greece, & Dr Riccardo Tonini, Italy

user report

- 42 **Use of CBCT in the diagnosis of cervical spine spondylosis**
| Drs Jorma Järnstedt & Prasun Dastidar, Finland

industry news

- 44 **New endodontic imaging mode from Planmeca yields detailed images without noise or artefacts**
| Planmeca Oy

meetings

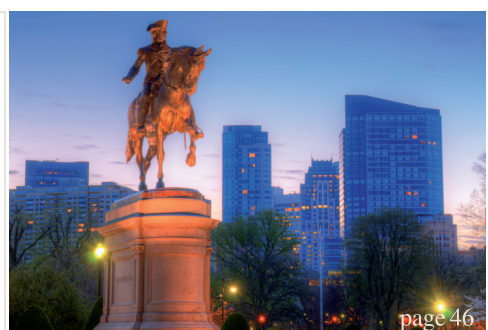
- 46 **International Congress on 3D Dental Imaging**
- 48 **International Events**

about the publisher

- 49 | submission guidelines
- 50 | imprint



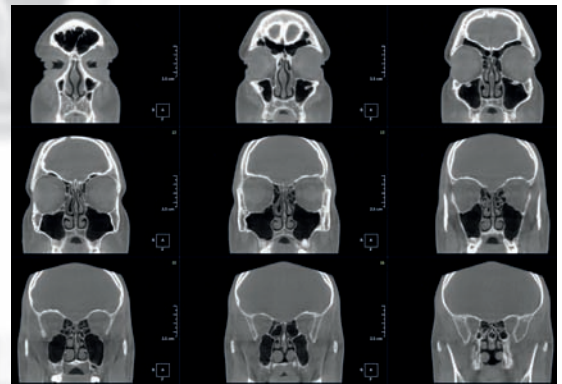
Cover image courtesy of
Dr Scott D. Ganz



SCANORA® 3Dx

The in-office Cone Beam CT system for Head & Neck imaging

Indispensable for
dentomaxillofacial and
ENT physicians and surgeons.



Diagnostic performance!

- Wide area of applications provides a quick return on investment
- Patients receive considerably less dose compared to medical CT
- Point-of-care operation provides CT results during the initial office visit
- Compatible with leading surgical navigation systems
- Complete solution with 3D software package

 **SOREDEX**

www.soredex.com

Digital
imaging
**made
easy™**

Clinical and diagnostics advantages of PreXion 3-D imaging system

Author _ Dr Dan McEowen, USA

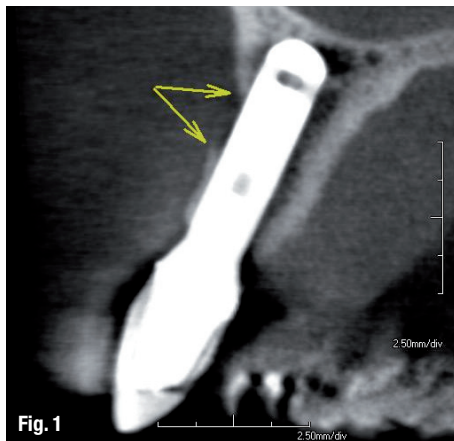


Fig. 1 _ Sagittal CBCT MPR showing bone defect at point of dehiscence of the implant coating.



Fig. 2 _ Periapical does not show the sinus anatomy or the width of the bone.



Fig. 3 _ MPR showing post-op of sinus graft and implant placement.

_ce credit cone beam

This article qualifies for CE credit. To take the CE quiz, log on to www.dtstudyclub.com. Click on 'CE articles' and search for this edition of the magazine. If you are not registered with the site, you will be asked to do so before taking the quiz. You may also



access the quiz by using the QR code below.

_For nearly 100 years, dentists have relied on 2-D radiographic imaging for diagnosis and treatment planning. With the 1999 introduction of cone beam computed tomography (CBCT), all dentists now have tools available for more accurate diagnosis and treatment.¹

The ability to look at a tooth in any direction and orientation, as well as in 3-D, eliminates much of the guesswork commonly experienced with 2-D radiographs.

We have been limited in most cases to only a buccal-lingual view provided by periapicals, bitewings and panoramic radiographs with the occasional axial view of an occlusal film. Medical CT scans and images began in the early 1970s and were sometimes used by dentists, offering our first multiplaner views.²

The adoption of 3-D cone beam imaging is appropriate and has important advantages for all modalities of dentistry. From every specialist to the general dentist, the increased amount of radiographic information as well as increased accuracy will aid in the most sound diagnosis possible.

_CBCT description

CBCT is a single or partial rotation of an X-ray source around the head, capturing X-rays on various flat panel arrays and sensors. The information is converted to a series of axial slices by computed tomography and stored as virtual anatomy in the computer.

With the use of sophisticated software, the dentist is able to view information in several different views, including: axial slices (head-to-toe orientation), coronal slices (front-to-back orientation), sagittal slices (side-to-side orientation) all known as multiplaner reconstructions (MPR). The thickness of each slice can be varied to include more or less information.

Because the voxels (volumetric pixels 3-D) are isotropic, other MPR images can be generated by slices drawn at any angle, curve or thickness through the scan to view areas critical to the final diagnosis.^{3,8}

The final view offered by CBCT is a 3-D view that can be rotated and viewed in any direction.

Once again through software manipulation, 3-D images can be viewed as conventional radiographs, maximum intensity projections (MIP), soft-tissue projections and a variety other views.

This nearly endless ability to manipulate the data aids in the diagnosis and identification of disease, nerve canals, sinus morphology, dental caries, bone density, fractures, endodontic pathology, implant placement criteria, periodontal defects, bone pathology, fractured teeth, iatrogenic trauma, TMJ morphology and disease, third-molar position and many more healthy or diseased conditions.

Early CBCT adoption with implants

The first and primary use of CBCT for early adopters was implant placement. As the scope and the value of the information became better known, dentists of all branches began to see the value of MPRs and 3-D renderings including periodontics, endodontics, oral surgery, treatment of TMJ, orthodontics, implantology and general dentistry.^{1,7,8}

Clinical periapical and panoramic radiographs for the placement of implants can be misleading with elongation, foreshortening, superimposition and geometrically incorrect data.^{7,8} A look at the implant in the periapical shows no obvious disease to an existing integrated implant. Clinically, a buccal fistula was present with exudate and slight pain. The CBCT scan (Fig. 1) reveals a more accurate view showing a buccal defect on a sagittal MPR. A surgical flap revealed a dehiscence of the coating of the implant. Removal of the foreign body resulted in an asymptomatic and healthy patient.

The evaluation of the available bone for the initial implant placement can be crucial for the long-

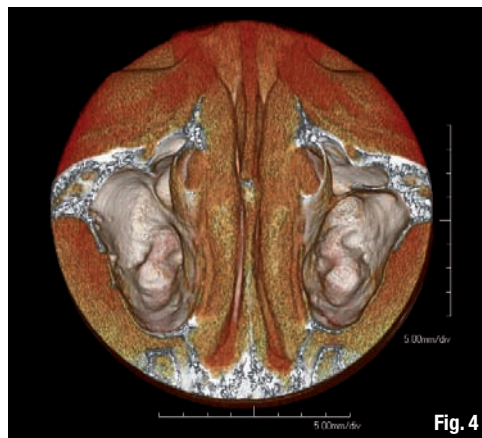


Fig. 4

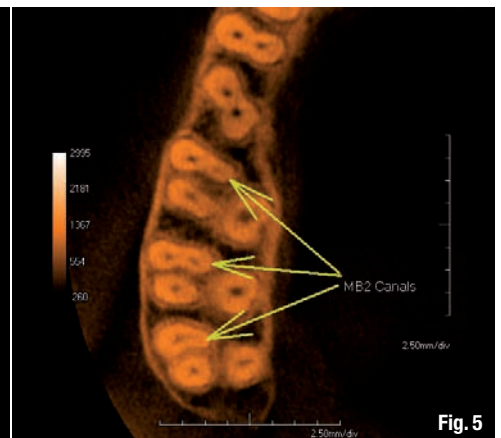


Fig. 5

term success of the case. If there is inadequate bone available, grafting may be a necessity. CBCT studies render the most accurate information available at a low radiation dose. The periapical shows an obvious lack of bone height, but does not show the buccal-lingual dimensions or an accurate view of the sinus morphology (Fig. 2).

The MPR view of the CBCT shows all necessary measurements to perform the sinus lift and grafting with the immediate placement of the implant fixture (Fig. 3). Three-dimensional views show the floor of the sinus and any soft-tissue pathology (Fig. 4). Having accurate measurements in all dimensions is an advantage of CBCT scanning.

CBCT and endodontics

Endodontics is a field that is rapidly adopting the use of CBCT and for good reason. The inherent geometric deficiencies of 2-D radiographs make the CBCT scan a valuable adjunct to investigate the root morphology in both 3-D and MPR. The typical periapical will show superimposed canals in the anteriors, bicusps and molars as well as unwanted bone densities both buccal and lingual to the affected tooth making the image quality poor.

Fig. 4 The 3-D CBCT showing anatomy of the maxillary sinuses.

Fig. 5 Axial MPR showing mesial buccal roots in first, second and third molars.

Fig. 6 Periapical showing minimal pathology with no radiolucency.

Fig. 7 Coronal MPR showing a short fill on the mesial lingual and radiolucency.

Fig. 8 Sagittal MPR showing unfilled canal and radiolucency.



Fig. 6

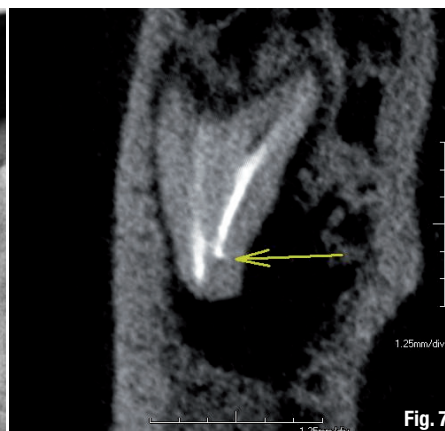


Fig. 7

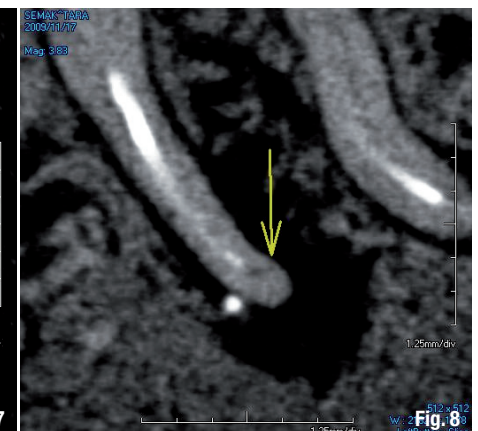


Fig. 8



Fig. 9

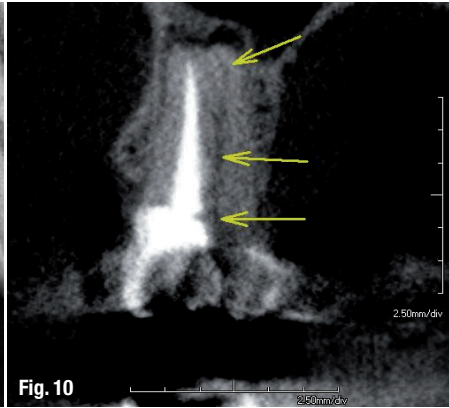


Fig. 10

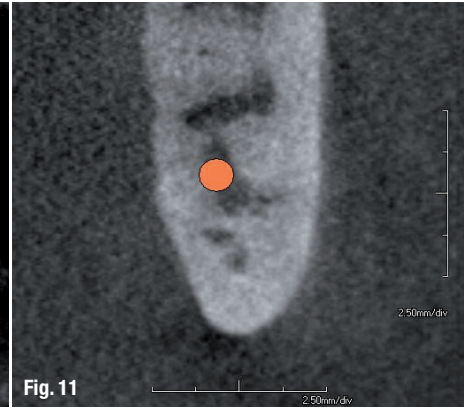


Fig. 11

Fig. 9 Periapical showing a normal fill with a radiolucency.

Fig. 10 Coronal MPR showing the superimposed lingual root unfilled.

Fig. 11 Coronal MPR showing nerve between roots of the third molar.

The ability to view MPR slices in cross-section, long axis and oblique directions gives the ability to follow all canals in any direction and show their relationship and measurements from other known structures. This virtual tour of the root morphology is a great benefit to the final treatment outcome (Fig. 5).^{3,4}

Post root-canal infection can be difficult to diagnose with the standard periapical. The endodontic fills may appear to be normal even though other clinical findings and symptoms are abnormal. The patient presents several months post root-canal treatment with pain on palpation and pressure and avoids this side of the mouth.

A periapical radiograph shows minimal pathology (Fig. 6). The roots appear to be filled and a small puff of sealer extends through the apex of the mesial roots. The distal root structure and fill appear normal. There is little indication of periapical radiolucency only a widening of the periodontal ligaments of the mesial roots.

A CBCT scan reveals a completely different picture. The coronal MPR reveals a short fill near the apex of the mesial lingual root and a large radiolucency (Figs. 7 & 8) not visible on the periapical radiograph (Fig. 6).

Missed canals are difficult to see in a buccal-lingual projection of the periapical radiograph as one canal is superimposed on the other (Fig. 9). Often, as viewed in this radiograph, we see periapical pathology with an apparent normally filled canal. CBCT scans allow dentists to look for pathology in MPR planes to identify the actual problem before invasive procedures are performed on the patient. The axial view shows a lingual canal exists and is untreated. The coronal view confirms the diagnosis and treatment can be completed (Fig. 10).

Today's endodontists, as well as general dentists, are benefiting from the diagnostic capabilities of

the high-resolution CBCT scanners available over conventional 2-D periapical.^{5,6}

Oral surgery

Oral surgery, with its inherent invasive nature, can be better served using CBCT with MPR as well as 3-D images. The ability to perform virtual surgery is a benefit to both the doctor and the patient. Doctors have the advantage of seeing morphology and landmarks in real time and space with accurate measurements, and patients will gain a better understanding of the problems and the solutions their doctors are offering them.

Third-molar extractions can be risky based on 2-D and panoramic radiographs. These radiographs can often superimpose nerves and sinuses over root structures. Dentists using 2-D radiographs must often rely on experience to assess the risks of iatrogenic trauma. The use of CBCT with MPRs and 3-D images reduces any guessing as well as the chance for any permanent damage to the patient. With the adoption of CBCT, the judgment is based on solid evidence and the risk will decrease.

A panorex of the superimposed third molars gave no solid evidence the canal lies between the roots. It is only with the use of CBCT and the MPRs that the nerve can accurately be seen traversing between the mesial buccal and mesial lingual root (Fig. 11).^{4,5}

Other surgical advantages include the identification and the position of supernumerary or impacted teeth. The images show accurate positions and show definitive morphology that will aid in removal of the proper teeth (Fig. 12). Knowing the exact position of many of these teeth is a benefit to both the doctor and patient. It will lead to the most precise surgical path and the least invasive procedure.

Periodontics

The explanation of periodontal problems are often misunderstood by the patient. As doctors we talk about

pockets, point to X-rays and propose treatment only to have patients refuse treatment because they do not understand what we are clinically describing. Using the 3-D portion of the CBCT scan can improve the understanding and acceptance of treatment plans. The images are a picture of the problem that is owned by that patient and much easier to understand by the layperson. Illustrating periodontal defects and pockets allows the patient to better participate in the process (Fig. 13).



Fig. 12

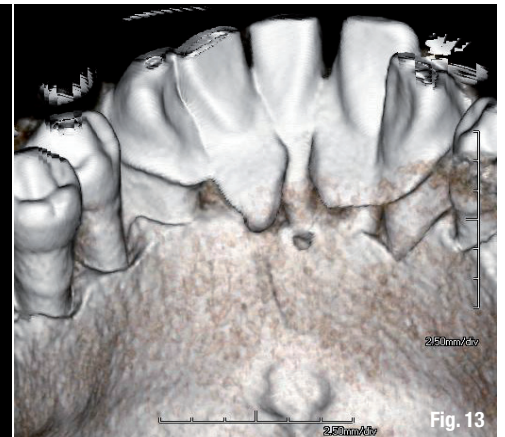


Fig. 13

The MPRs and the 3-D projections aid in surgical planning for periodontists, allowing for accurate measurements and bone analysis prior to osseous surgery that doctors cannot get using the periapicals or panoramics. Studies have shown that CBCT images are more accurate than panoramic radiographs. For the periodontist placing implants, the ability to measure bone density and avoid important anatomy is important.^{4,5}

_Orthodontics

Orthodontists are beginning to adopt large field-of-view CBCT. Recent studies show that linear measurements of bony structures are more accurate using CBCT and have less distortion than currently used methods of measurement: lateral cephalometric, posteroanterior (PA) and submentovertex (SMVT).⁵ Accurate measurements of tooth volume and tooth position can aid in accelerated treatment times and more precise treatment.

Along with tooth position, density of bone and size of arches, the orthodontist also has an accurate evaluation of the temporomandibular joint and position of the condyles. Impacted teeth are easily identified and position either buccal or lingual can be confirmed prior to movement or removal. Both MPRs and 3-D projections give the clinician a complete picture of the problems and the treatment course.

With a single CBCT scan, orthodontists can produce all of the information they need: panoramic, cephalometric, PA, SMVT, tooth size and volume, crowding evaluation in any plane, TMJ evaluation and airway analysis, all with both soft-tissue and skeletal information.^{5,7}

_Conclusion

We treat our patients in 3-D, and now, with cone beam computed tomography, we are changing the way we diagnose from 2-D to 3-D. The addition of this technology will increase your diagnostic

skills with better and more complete information at your disposal. As with any type of invasive diagnostic tool, clinicians should weigh the risk to benefit in using CBCT scans.

Judicious use of CBCT and knowledge of patient's lifetime doses should always be a consideration as well as the availability of other diagnostic tests appropriate for the problems of the patient. When adopting new technology, training is paramount. Along with training comes the responsibility of the doctor to read and diagnose information from CBCT scans.

Do not avoid CBCT from lack of knowledge; instead, take this opportunity to become a better diagnostician and radiologist. As you review radiology and pathology, your use of CBCT will aid in making the most accurate diagnosis and the most complete treatment plans.

Editorial Note: A complete list of references is available from the publisher.

_about the author

cone beam



Dr Dan McEowen

is a 1982 graduate of Loma Linda School of Dentistry and has been in private practice for 26 years. He is a founding member of the World Clinical Laser Institute, achieving a mastership level of proficiency.

He has been active in FDA approval of oral surgery techniques using Erbium lasers. McEowen has lectured and trained internationally in techniques using lasers in general and specialty dental fields. He is a member of the ICOI and is active in implantology. McEowen has been involved in cone beam technology for more than five years and owns 3-D Imaging Center in Maryland.

Dental implantology— An evolving treatment modality

Author _ Dr Scott D. Ganz, USA



Fig. 1 _ Cone Beam Computed Tomography (CBCT) allows for complete three-dimensional views of patient anatomy.

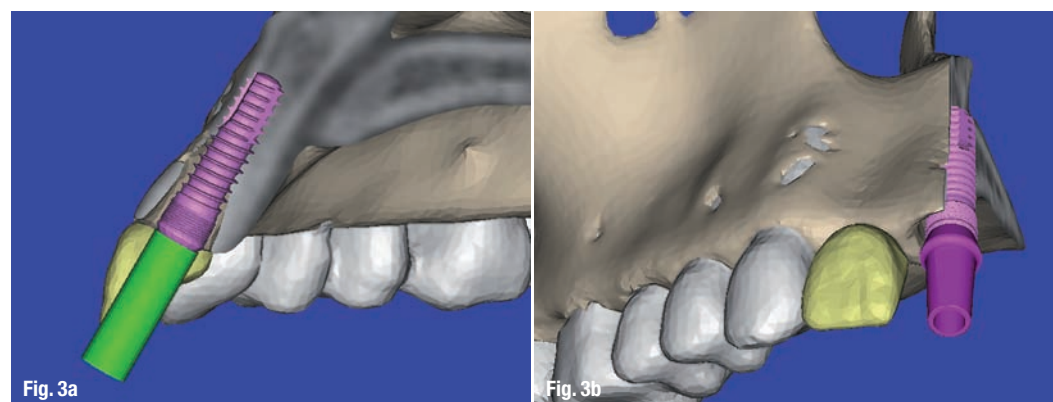
Figs. 2a & b _ The ability to merge CBCT imaging with intra-oral optical impressions, conventional impressions, or stone casts enhances (a), planning accuracy and template design (b).

_Over the past 30 years implant dentistry has evolved into a predictable, even conventional, treatment alternative for patients who are missing teeth. In fact, the art and science of implant dentistry has expanded to include many ancillary supporting modalities such as bone grafting, ridge splitting, sinus augmentation, soft-tissue grafting, biologic modifiers, 3-dimensional (3-D) imaging technologies, CAD/CAM technologies, guided surgery applications, and enhanced restorative materials.

Diagnosis and treatment planning for dental implants has dramatically improved with the advent of computed tomography (CT), followed by a proliferation of lower dosage cone beam CT (CBCT) devices. Two-dimensional (2-D) periapical radiographs and panoramic radiography are inherently deficient in their ability to provide accurate diagnostic information for dental implant place-

ment and related surgical procedures due to potential distortion and ability to communicate three-dimensional information related to the maxillo-mandibular anatomy. Prior to the scalpel touching the patient, the ability to assess the individual patient-specific anatomy is now a clinical reality with advanced imaging technologies and interactive treatment planning software (Fig. 1). The quantity and quality of bone can be determined, aiding clinicians in making educated decisions regarding treatment. Implant receptor sites can be evaluated with ever-increasing accuracy, based upon complete visualization of the buccal and lingual cortical plates and intermedullary bone.

However it has been stated that "the goal of implant dentistry is not the implant, it is the tooth that we replace." Therefore if clinicians wish to achieve restoratively or prosthetically-driven implant reconstruction there needs to be a complete



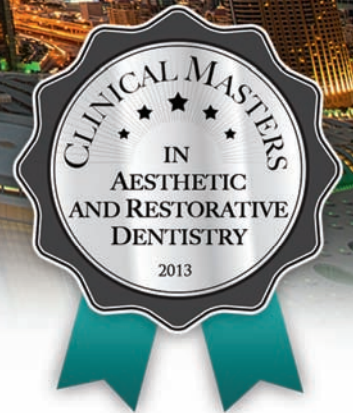
Figs. 3a & b _ The use of interactive treatment planning software allow for simulated implants and abutments to help visualize the link to the proposed tooth.



Tribune CME

6 Months Clinical Masters Program in **Aesthetic and Restorative Dentistry**

29 January - 01 February and 24-27 April 2014,
a total of 8 days of intensive live training with the Masters in **Dubai** (UAE)



2 on location sessions, **hands on** in each session
+ online learning and mentoring

Learn from the Masters of Aesthetic and Restorative Dentistry:



Dr. Angelo Putignano



Dr. Francesco Mangani



Dr. Daniel Edelhoff



Dr. Stavros Pelekanos



Dr. Panos Bazos

Registration information:

29 January - 01 February and 24-27 April 2014,
a total of 8 days of intensive live training with the Masters in Dubai (UAE)

Curriculum fee: € 6,900

Details on www.TribuneCME.com/128

contact us at tel.: +39 011 0463350
email: segreteria@tueor.com

Collaborate on your cases

and access hours of
premium video training
and live webinars



University of the Pacific

you will receive a
certificate from the
University of the Pacific



Latest iPad with courses

all registrants receive
an iPad preloaded with
premium dental courses



100 ADA CERP
C.E. CREDITS

ADA C.E.R.P.® | Continuing Education
Recognition Program

Tribune America LLC is the ADA CERP provider. ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

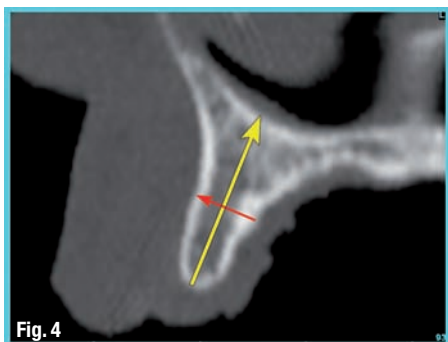


Fig. 4

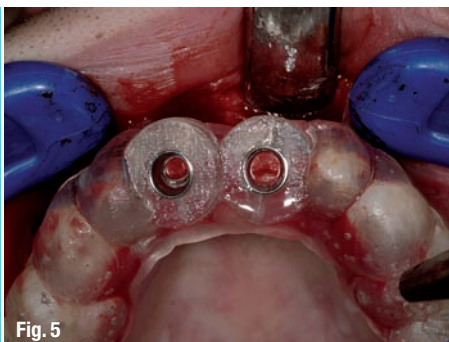


Fig. 5



Fig. 6

Fig. 4_ Precise measurements of available bone can be made in the cross-sectional view.

Fig. 5_ A tooth borne surgical guide containing guide cylinders for accurate drilling.

Fig. 6_ Full template guidance allows for the implant to be delivered through the guide with specially designed carriers.

understanding of the relationship between the tooth and the underlying bone.

The ideal pre-surgical workflow should require conventional impressions and mounted articulated study casts. A diagnostic wax-up, or duplicate of the patient's denture representing the desired tooth position can then be utilized to fabricate a radiopaque scanning appliance to be worn by the patient during the scan acquisition. Depending on the interactive treatment planning software, protocols can differ requiring fiducial markers that act to register the digital information to the CBCT scan data. Additionally, the proliferation of optical scanning devices at dental laboratories, or intra-oral optical scanners can play a role in acquiring this digital information that will be merged with the data from the CBCT scan enhancing the accuracy of the planning software (Figs. 2a & b). Utilization of a scanning appliance provides the clinician an unparalleled ability to visualize the relationship between the tooth and the underlying bone. Using an interactive treatment planning software such as SimPlant (Materialise Dental), NobelClinician (Nobel Biocare), Treatment Studio/Invivo5 (Anatomage), BlueSkyBio (Blue Sky Bio) the virtual implant can then be positioned within the receptor site to fit within the envelope of the desired restoration. However, it needs to be noted that the link between the implant and the tooth is the abutment. Therefore it is essential to place a virtual abutment or an abutment "projection" with an appropriate vertical height to visualize the spatial positioning of the abutment as it relates to the tooth to achieve restoratively driven outcomes (Figs. 3a & b).

_Utilizing the data

The utilization of CBCT imaging and interactive treatment planning has been increasing in its adoption for planning both the surgical and prosthetic phases of treatment.

Once the scan is taken regardless of whether a scanning appliance is used, the clinician has several options in utilizing data:

- _ diagnostic-freehand;
- _ template-assisted;
- _ and full template guidance.

Each CBCT device has its own native software which can provide valuable three-dimensional information about the patient's anatomical presentation.

The concept of *diagnostic-freehand* can be divided into two applications:

- _ the surgeon can visualize this data, make measurements, plan the implant positions, communicate with the restorative dentist and then perform the surgical placement free-hand based on his/her personal level of experience;
- _ or the CBCT data (DICOM—digital communication in medicine) can be imported into an interactive treatment planning software where there are additional diagnostic and implant planning tools to enhance the process (Fig. 4). The surgeon can then perform the surgery free hand based upon the information gleaned from the virtual plan.

Template-assisted protocol can be described where the information from the interactive treatment planning software can be utilized to fabricate a surgical guide. Surgical guides come in several types including bone borne, tooth borne, or soft tissue/mucosal borne and contain guide cylinders that correspond to the drilling sequence for osteotomy creation (Fig. 5). Surgical guides can be used in flapless/minimally invasive, or flapped surgical procedures helping to increase accuracy, minimize surgical time, and potential patient morbidity.

Full template guidance encompasses perhaps the most important innovation where there is a link between the surgical guide and the implant manufacturers' components. The development of implant specific hardware allows for full template guidance—when it is possible to deliver the implants through the guide with specially designed carriers that provide for the most precise place-



Fig. 7



Fig. 8a 86

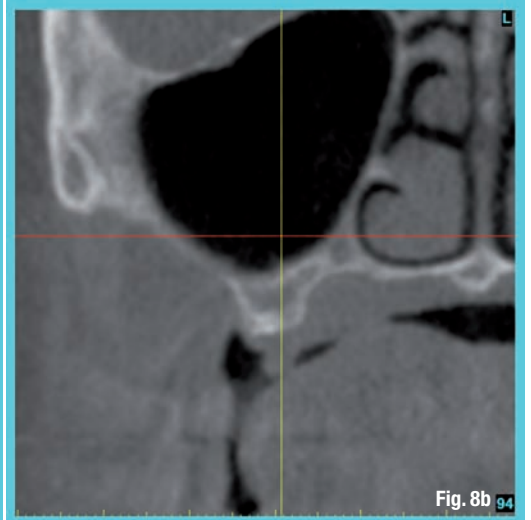


Fig. 8b 94

ment (Fig. 6). Full template guidance has been made possible by the collaboration between dental implant manufacturers and interactive treatment planning software companies who have continued to develop innovative solutions to treating our patients.

_Bone volume preservation

3-D imaging technologies can identify areas with great clarity areas that have insufficient bone volume for implant placement. It is well documented that atrophy of the bone can occur once teeth have been removed from the jawbone. When a tooth needs to be extracted, preservation of the alveolar ridge has become a significant and practical procedure to prevent resorption and to provide enough bone volume for future dental implant placement. If there is not enough bone volume within a designated receptor site to place an implant, many options are now available to replace missing anatomy to create a sound foundation for future implant placement. The area of biologics has greatly expanded the choices for clinicians to determine the appropriate method and materials to rebuild lost soft- and hard-tissue anatomy. Demineralized bone, mineralized bone, bone putties, allografts (human cadaver bone), and xenografts (bovine bone), as well as combinations of particulate and block graft materials, are available as scaffolds to increase volume and promote new bone growth. There are also a variety of different resorbable and nonresorbable membranes of various materials that can be used in conjunction with grafting procedures with and without tenting screws to preserve space as an aid to the remodeling process. The most popular membranes are made from different configurations of collagen matrices, and can be short-acting or long-acting depending on the desired usage.

Use of autologous biomaterials has also been expanded since the development of platelet-rich plasma (PRP) many years ago. Natural bioactive membranes can be fabricated from the patient's own blood for the purpose of enhancing hard- and soft-tissue healing. PRP protocols are basically enhanced fibrin glues. Recent advances with platelet-rich fibrin (PRF) create a true fibrin-based biomaterial that can function as a membrane with its improved properties and incorporation of significant growth factors. As a completely autogenous material developed from the patient's own blood, the membranes derived from this process are easy to handle and inexpensive to produce. These membranes can be used to cover surgical sites, mixed with bone grafting materials, acting as optimized blood clot (Fig. 7).

Other biologics that have evolved include recombinant human bone morphogenic proteins which have shown clinical efficacy, although they remain quite expensive, and thus have limited applications.

_Sinus grafting

Sinus augmentation procedures were introduced years ago to provide a new foundation for the placement of dental implants in the severely resorbed posterior maxilla. CBCT imaging allow for total inspection of the sinus to evaluate potential pathology as well as to plan the grafting procedure (Figs. 8a & b). New surgical techniques and instruments have significantly simplified maxillary sinus surgery, by decreasing the potential of perforating the Schneiderian membrane through the selective cutting action of hard tissue and not soft tissue. Creating a piezoelectric bony window osteotomy can be accomplished without damaging the soft tissue, followed by

Fig. 7 Autologous platelet-rich fibrin matrix (I-PRF) can be utilized to promote healing for various intra-oral applications.

Figs. 8a & b A cross-sectional view of the maxillary sinus revealing pathology (a). Total inspection of the sinus helps determine the type of access and amount of bone graft material required (b).

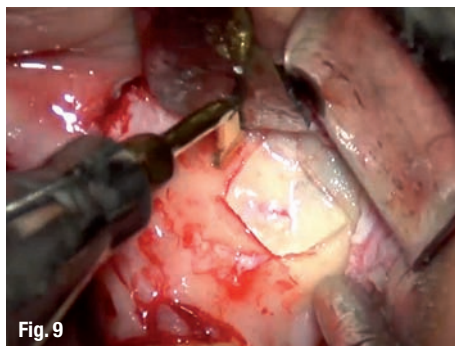


Fig. 9

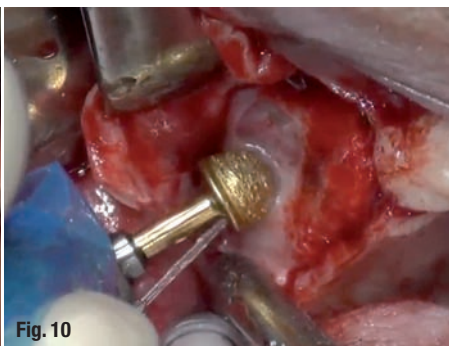


Fig. 10



Fig. 11

Fig. 9 _ A lateral window approach facilitated by piezo-electric surgery can be accomplished without damaging the soft tissue membrane.

Fig. 10 _ Large and small diameter diamond-coated drills offer new solutions to lateral window and trans-crestal sinus grafting procedures.

Fig. 11 _ A CAD/CAM designed implant-supported full arch monolithic zirconia restoration is planned on the computer screen.

piezoelectric sinus membrane elevation to separate the membrane without causing perforations (Fig. 9). The concept of piezoelectric surgery has now been utilized for ridge-splitting, intra-oral bone harvesting from the ramus and chin, orthodontic procedures, impactions, distraction osteogenesis and much more.

Other innovations for sinus grafting include the development of new surgical kits that include a variety of specially designed large and small diamond-coated drills for crestal and lateral approaches to adding bone into the sinus without perforation (Fig. 10). These instruments are available from a variety of different companies that include predefined stoppers, sinus elevation instruments, osteotome inserts allowing clinicians to perform a well-controlled maxillary sinus augmentation.

a significantly improved end-product. CAD/CAM technology has been now utilized to fabricate full arch restorations from monolithic zirconia providing enhanced strength without compromising aesthetics (Fig. 11).

The evolution of dental implants will continue as the industry progresses in combining both the art and science of replacing lost intraoral anatomy and as dentistry remains committed to developing improved methods and materials to treat patients who require these services.

Editorial note: Modified from the original published in Compendium. © 2013 to AEGIS Publications, LLC. All rights reserved. Reprinted with permission from the publishers.

_ Restorative enhancements

The restorative phase of implant reconstruction has seen significant evolution in components, manufacturing processes, impression methodologies, and materials. Perhaps the most important technological change has been the increased use of CAD/CAM technologies for custom abutments, bar and prosthesis fabrication. Due to the fact that most implants may not be placed ideally, and that round implants are not true representations of natural tooth morphology, custom abutments are a necessity for the restoration phase. The lost-wax casting method has many issues including the labor intensive method to fabricate custom abutments. CAD/CAM technology allows a higher degree of accuracy, consistency, improved emergence design and morphology, avoiding the porosities and distortion that can occur with analogue casting methods. In addition, custom abutments can be fabricated from titanium or more aesthetic materials like zirconia. CAD/CAM bars for overdenture applications or as a base for fixed-detachable hybrid restorations have also benefitted from advances in computer design and highly accurate machining to create

_ about the author

cone beam



Dr Scott D. Ganz currently maintains a private practice for Prosthodontics, Maxillofacial Prosthetics, and Implant Dentistry in Fort Lee, New Jersey, USA. Dr Ganz has been voted one of the "Best Dentists in America,"

"Top Dentists in New Jersey," and served as Past President of the NJ Section of the American College of Prosthodontists, and the Computer Aided Implantology Academy (CAI).

Dr Ganz delivers presentations worldwide on both the Surgical and Restorative phases of Implant Dentistry and has published extensively on these topics. He is considered one of America's leading experts in the evolution of computer utilization and interactive software for diagnostic and treatment planning applications using CT and newer generation Cone Beam CT imaging modalities.



DENTAL TRIBUNE
DT STUDY CLUB
COURSES | DISCUSSIONS | TECHNOLOGY | ON-DEMAND

www.DTStudyClub.com

Live, Interactive Webinars and On Demand Courses

A growing education platform where you can find more than 400 dental courses, live Webinars, live Education Symposia.

Interested in C.E. credits and quality learning?

Learn from the experts:

Richard Niederman
Louis Malcmacher
Eduardo Mahn
Robert Horowitz
Paul Weigl
Shamshudin Kherani
Christian Coachman
Ron Kaminer
Edgar Garcia Hurtado
Glenn van As
Marc Gottlieb
John Fluke

Marius Steigmann
David Hoexter
Dwayne Karateew
Fotinos S. Panagakos
George Freedman
Howard S. Glazer
Lynn Mortilla
Maria Emanuel Ryan
Michael Glick
Peter Barry
Barry Levin
Fay Goldstep

Interested in sponsoring education?

Some of our partners:



"83% of the dentists visited the exhibiting sponsors as a result of attending the Symposia."

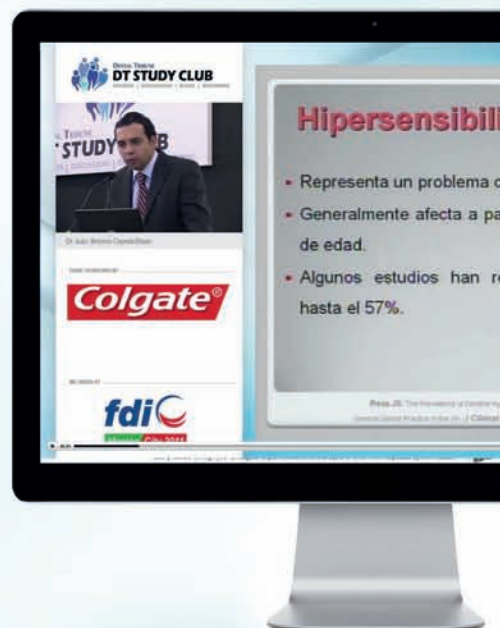
this is what we've learned from our customers

Register for **FREE** on www.DTStudyClub.com



How to receive your C.E. Credits?

1. Go to www.DTStudyClub.com and log in.
2. Not a member yet? Register for a free account.
3. Find the courses you're interested in and register to access them.
4. Watch the course.
5. Take the Quiz and print the C.E. certificate.



ADA C.E.R.P.® | Continuing Education Recognition Program

ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

Prevention of failures in oral implantology

Author_ Dr Dov M. Almog, USA

Fig. 1_ Implant fracture.

Fig. 2_ Impingement on adjacent tooth.

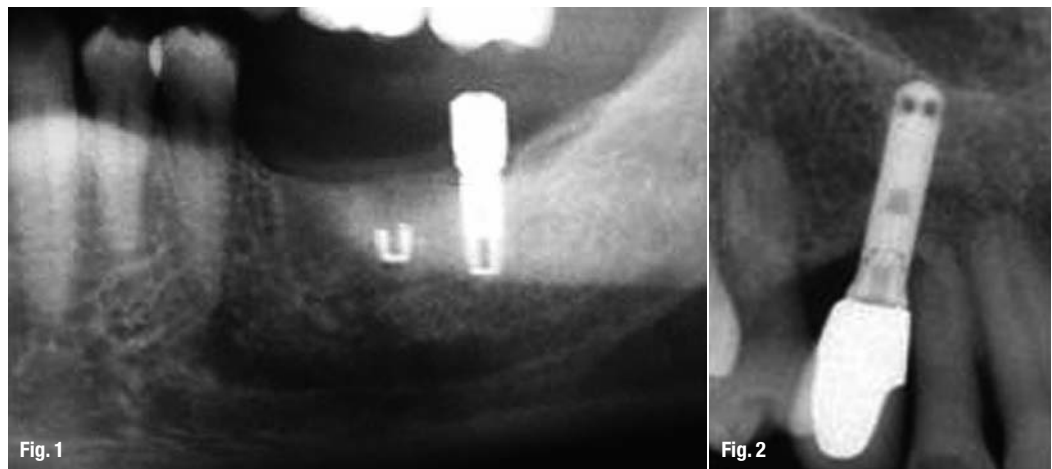
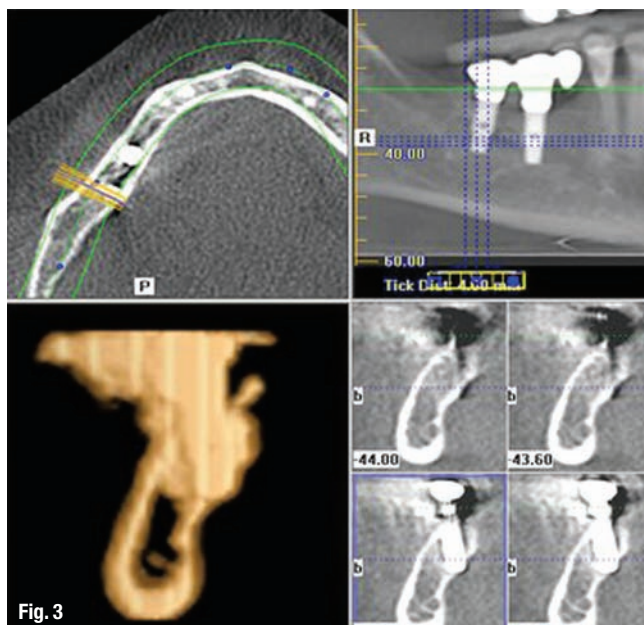


Fig. 3_ Perforation of the lingual undercut.



_Intra-oral and panoramic images are not 3-D and clinicians can obtain only vague measurements from them owing to magnification changes due to positioning. In addition, they are not efficient for viewing certain pathologies. In response to these limitations, CBCT 3-D imaging

technologies were developed. CBCT 3-D captures a volume of data and, through a reconstruction process, it delivers images that do not contain magnification, distortion and/or overlapping anatomy.

In recent years, CBCT 3-D has begun to make significant inroads into every discipline in our dental profession, expanding the horizons of clinical dental practice by adding a third dimension to cranio-facial treatment planning. CBCT uses advanced 3-D technology to provide the most complete anatomical information on a patient's mouth, face and jaws areas, leading to enhanced treatment planning and predictable treatment outcomes.

Essentially, this represents a paradigm shift, where measurements and anatomical relationships are precise and provide practitioners with a clear understanding of their patients' anatomical relationships. According to dental practitioners using this technology, it helps them perform treatment more efficiently.

Regarding oral implantology, it is estimated that growth in implant-based dental reconstruc-



Fig. 4



Fig. 5

tion products will outstrip all other areas of dentistry, according to Kalorama Information.¹ The traditional method of replacing a tooth with a dental bridge has been shown to be problematic, and more permanent solutions are urgently needed.

With a rapidly ageing population in the developed world and the resulting enormous need for dental restoration, a large number of companies have seen the opportunity to adopt these sophisticated dental techniques. And indeed, as some have predicted, the growth in dental implant-based procedures has increased considerably in recent years.

As a result, there has been a rapid increase in the number of practitioners involved in implant placement, including specialists and generalists, with different levels of expertise. At the same time, a number of unusual complications associated with these procedures have arisen.

A literature and web search revealed several published reports of such complications, which include implant fractures (Fig. 1), impingement on adjacent teeth (Fig. 2), perforation of the lingual undercut (Fig. 3), sinus perforations (Fig. 4) and implants displaced into the maxillary sinus (Fig. 5).

The clinical management associated with some of these complications is difficult at times and considered very invasive. Therefore, while the quantitative relationship between successful outcomes in dental implant treatment and CBCT-based dental imaging is unknown and awaits discovery through large prospective clinical trials, I strongly believe that using CBCT- and 3-D-based dental imaging is becoming a reliable procedure from a precautionary standpoint based on a series of recent preliminary clinical studies and case reports.

I also strongly believe that by taking 3-D CBCT images prior to placing dental implants, many of the above-mentioned complications can be circumvented.

Editorial note: Dr Almog's presentation, Introduction to CBCT, especially as it pertains to prevention of failures in oral implantology, at the Dental Tribune Study Club Symposia at Greater New York Dental Meeting 2010 is available online at www.DTStudyClub.com.

Reference

1. Kalorama Information, "Implant-based dental reconstruction: The worldwide implant and bone graft market", 2007 www.kaloramainformation.com/pub/1099235.html, accessed 6 June 2011.

_about the author

cone beam



Dr Dov Almog is a Prosthodontist with more than 30 years of diversified professional experience in clinical, academic and research environments. His publications include articles on CBCT, dental implants, carotid artery calcifications and practice management.

In 2003, in acknowledgment of his research on incidental findings of carotid artery calcifications on panoramic radiographs, he received the Arthur H. Wuehrmann Award from the American Academy of Oral and Maxillofacial Radiology. Dr Almog currently serves as chief of the dental service for the VA New Jersey Health Care System of the US Department of Veterans Affairs.

Adapting CBCT in private practice: A personal experience

Author _ Dr Barry Kaplan, USA

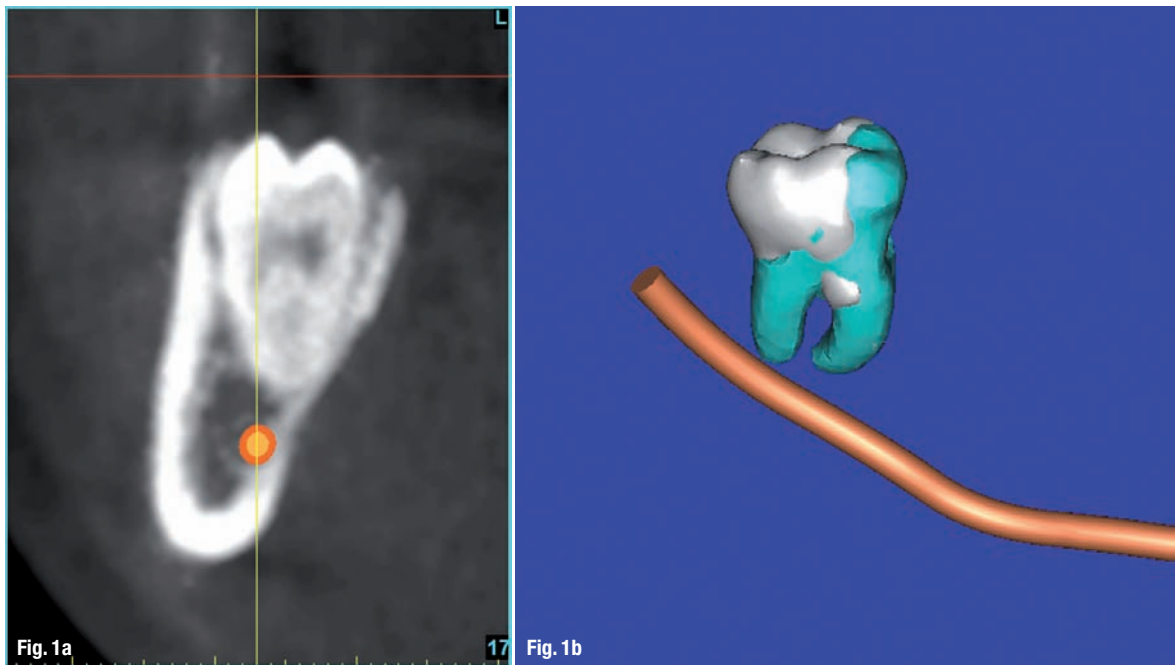


Fig. 1a A cross-sectional view of the mandibular right third molar showing its proximity to the mandibular nerve.

Fig. 1b Same view using third-party 3-D software (SimPlant, Materialise Dental). The software uses the DICOM data obtained from the scan.

_Consider the allegory of a pilot navigating a plane with no cockpit controls and poor visibility. It is too dark to see, and there are no reference points to help the pilot guide the plane. At this point, the sky is a 2-D world. This scenario is frightening to even the most skilled pilots: navigating the unknown.

Implant dentistry offers similar challenges in navigating the implant properly into the receptor site so that it meets the surgical and prosthetic goals of the plan. In order to achieve proper implant placement, we need predictability.

As a trained prosthodontist, it has always been my goal to achieve a high degree of predictability. When evaluating implant receptor sites, I realised early on the need for top-down cognition during the treatment planning process.

In other words, the teeth are first visualised in their ideal prosthetic position and then the implants are planned in each potential receptor site to best suit the intended position of the teeth or occlusion. Unless you control those steps, the process is guided by a level of guesswork, and therefore you are not flying with full control.

It is well established that a 2-D radiograph and/or panoramic radiograph of the bone does not provide the information necessary to fully appreciate the spatial topography of the 3-D receptor site. An analogy would be observing two stars that appear close together in the night sky that are actually light-years apart.

Another issue with 2-D radiographic modalities is that they have varying degrees of distortion. Once I realised that there were these types of errors with 2-D imaging, I came to the understanding that 3-D imaging gave me the best chance of optimising control of implant placement, and avoiding vital adjacent anatomy.

Prior to the last decade, the only way to access this technology was by referring your patient to the hospital radiology department or imaging centre for a medical-grade CT. In that venue, we lacked control of some of the process, including proper head position, optimum slice thickness, resolution and higher radiation exposure which may have affected the diagnostic quality of the images. All of this changed with the advent of CBCT scanning devices that have made the 3-D technology accessible to the dental profession in a cost-effective way.

My early attempt to interface with 3-D imaging technology was to send the patient to a separate location for a CBCT scan. This posed some logistical problems in terms of having the patient scheduled in a timely fashion, and was inconvenient, as this required going to a unfamiliar facility. Many patients will lose motivation when too many barriers are encountered, such as travelling to a distant centre for image acquisition.

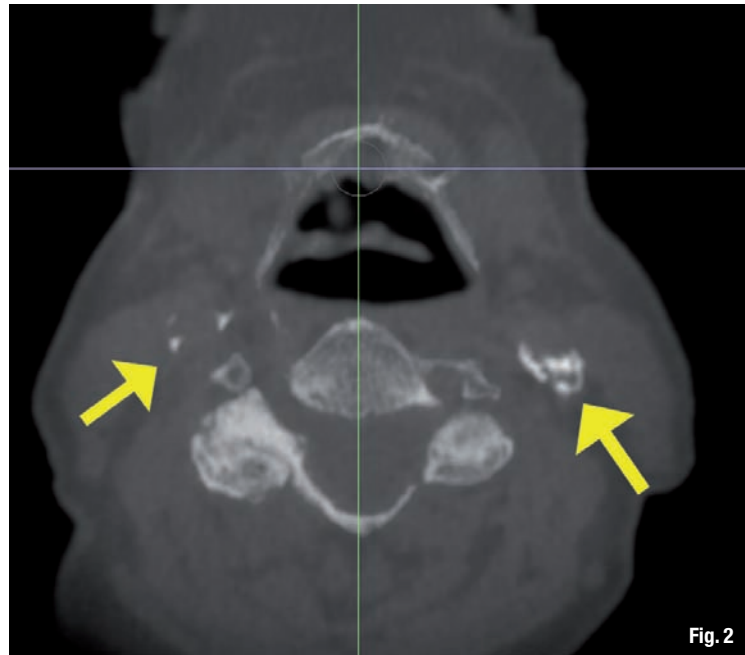


Fig. 2

Fig. 2 An axial slice revealing carotid artery calcification (yellow arrows).

It was still essential that the patient's head was properly positioned in the machine. If the head is not positioned properly, erroneous information may be gleaned from the cross-sectional images.

Another potential source of error in a large imaging centre is whether the machines are periodically calibrated to insure consistent accuracy. Lastly, unless the doctor is present during the image acquisition (at the imaging centre), he or she is unable to ensure that pre-scan details are attended to (e.g. cotton rolls between the teeth or the proper seating of a radiopaque scanning appliance).

In order to overcome some of these issues, my next progression was to try a mobile imaging service. A specially equipped van fitted with a

Fig. 3a A digital panoramic radiograph (from CBCT) showing large ameloblastoma in the mandible.

Fig. 3b A cross-sectional slice of the mandibular left molar area showing destruction by the ameloblastoma of the buccal plate.

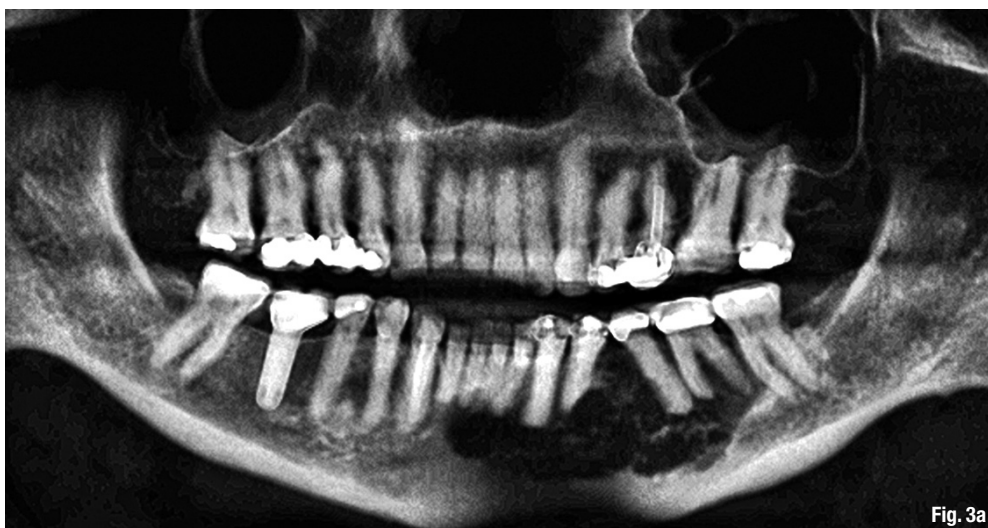


Fig. 3a

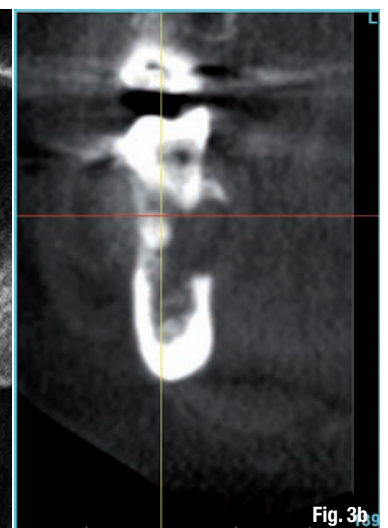


Fig. 3b

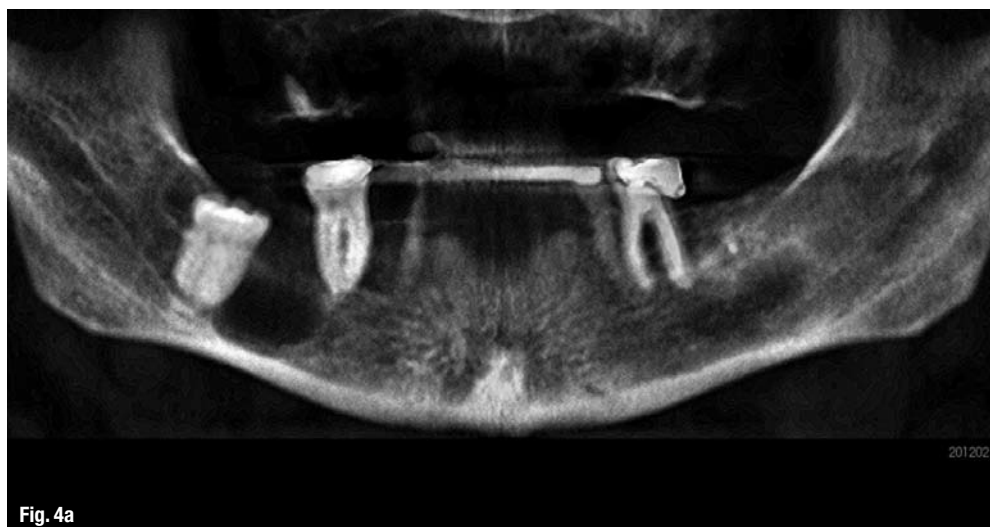


Fig. 4a

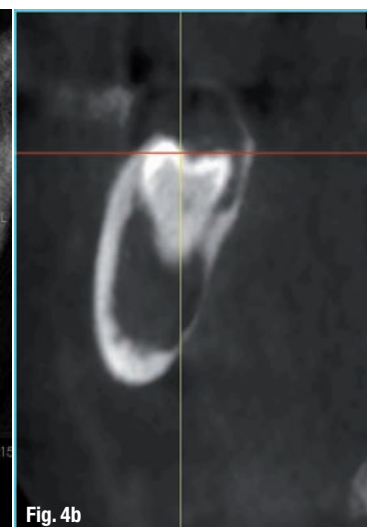


Fig. 4b

Fig. 4a_A digital panoramic radiograph (from CBCT) showing a large odontogenic cyst in the mandibular right side.
Fig. 4b_A cross-sectional slice of the mandibular right molar area showing large-area destruction by the cyst.

CBCT device will travel to your office or the patient's home. Although this is much more convenient for the patient, reliability of these services is sometimes questionable and there may be concerns again about calibration due to relatively imperfect road surfaces, which may cause the machine to bounce around in the van. In addition, there may be issues with transferring the data, depending on the software applications that are to be used.

All of the points in contention were resolved when I decided to purchase a CBCT device for my office. After investigating all of the machines, I decided on an i-CAT Classic (Imaging Sciences)

Having CBCT technology in the office has provided me with the control that I desired and has made a dramatic change in our daily workflow, with instant access to the technology. Literally within seconds, patient anatomy can be viewed in three different orthogonal views (axial, coronal and sagittal), as well as a 3-D reconstructed solid model view—all with total interactivity afforded to me through the software applications.

The complete visualisation of the anatomy can be viewed and information assessed almost immediately. Treatment planning is expedited, since the patient does not have to schedule an appointment at a separate location. In addition to passively viewing the images on the LCD screen, the data can be imported into third-party software that allows for virtual 3-D implant placement, providing me with the tools that I need to remove all of the guesswork associated with 2-D imaging.

The treatment plan can be shown on a large screen in my office or on my laptop to each pa-

tient, greatly enhancing treatment acceptance. Once accepted by the patient, the treatment plan can then be accurately carried out via a surgical guided derived from the 3-D planning software.

Other advantages of CBCT imaging in the office that I have found highly rewarding are airway analysis for sleep apnoea patients; interpretation of hard-tissue pathology (Figs. 3a & b, 4a & b); identification of vital structures during oral surgery procedures (Figs. 1a & b), such as third-molar extractions; periodontic/endodontic evaluations; and identification of radiopacities suggestive of carotid artery calcification, requiring further evaluation by a radiologist (Fig. 2).

Having CBCT in the office has allowed me to have a greater understanding and appreciation of the anatomy and related structures of each patient. This knowledge is then applied during the treatment planning process to determine which tissues are deficient and with careful attention to vital structures so that implants can be placed in the most optimal receptor sites. Honestly, I do not know how I could practice without a CBCT device in my office today.

_about the author

cone beam



Dr Barry Kaplan,
Prosthodontist, Bloomfield,
N.J., USA. Past President of
the NJ Section of the American
College of Prosthodontists,
Fellow of the International Congress
of Oral Implantologists (ICOI).

www.kaplandentistrynj.com



Bio-Emulation™ Colloquium

The Santorini Experience



Tribune CME



June 21-22, 2014, Santorini Greece

Go ahead and treat yourself to a world class dental colloquium at a top 10 vacation destination! Be part of the Bio-Emulation movement.

Mentors



Pascal Magne



Michel Magne



Francesco Mangani



Francesca Vailati



Gaetano Calesini

Emulators



Panos Bazos



Gianfranco Politano



Javier Tapia Guadix



Leandro Pereira



Jason Smithson



Claudio Pisacane



Stephane Browet



Gil Tirlot



David Gerdolle



Sascha Hein



Lucas Zago Naves



Andrea Fabianelli



Giancarlo Pongione

Registration information:

June 21-22, 2014, Greece
The Venue will be held at
the Petros M. Nomikos Conference Centre, Fira

Colloquium fee: € 799

Details on www.TribuneCME.com

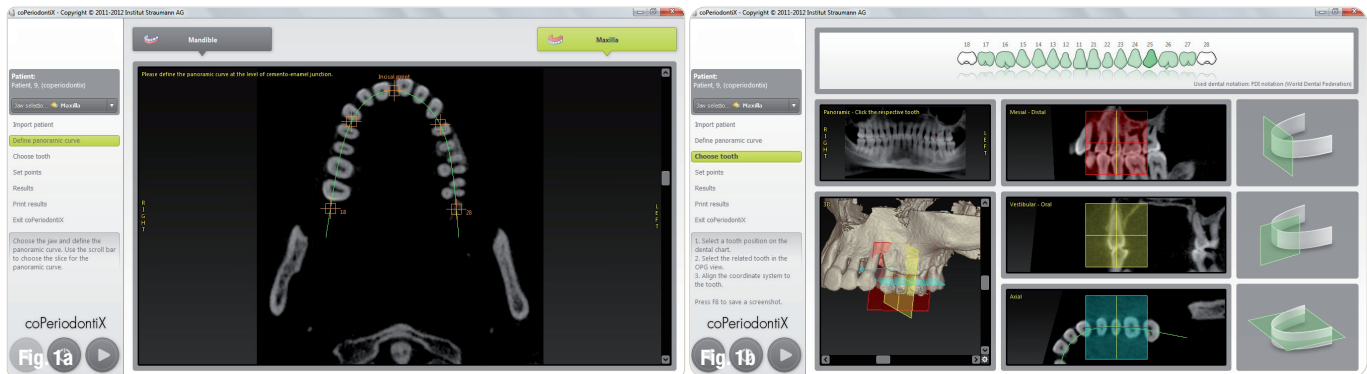
contact us at tel.: +49 341 48474 302
email: request@tribunecme.com

ADA C.E.R.P.® | Continuing Education
Recognition Program

Tribune America LLC is the ADA CERP provider. ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

coPeriodontiX: Three-dimensional evaluation of circumferential periodontal bone level using cross-sectional CBCT data

Authors_Drs Jonathan Fleiner, Andres Stricker & Dirk Schulze, Germany

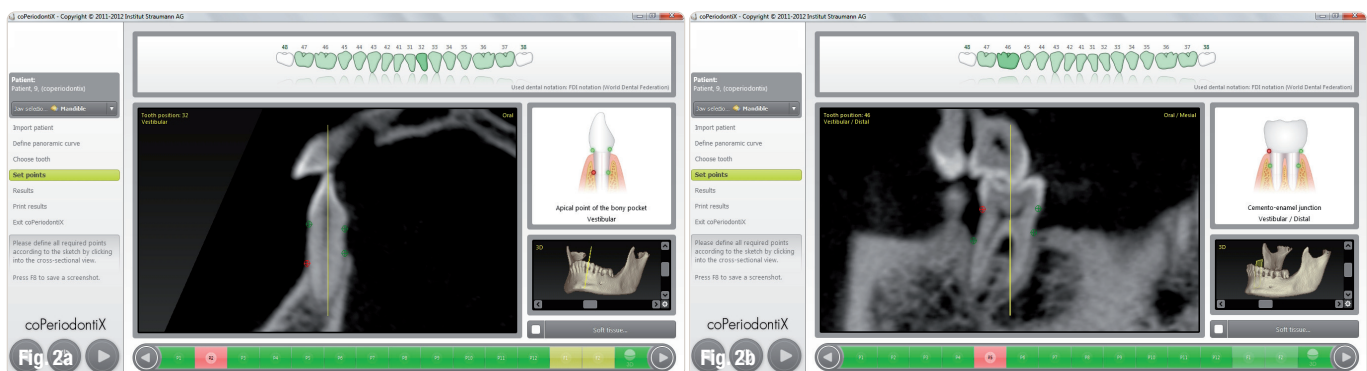


_coPeriodontiX (Dental Wings Inc.) is the software to offer the 3-D evaluation of periodontal bone status using cross-sectional CBCT image data. The aim is the measurement of bone progression prior to, during, and after treatment, as well as monitoring to measure the effectiveness of regenerative treatment. X-ray images have always proven a valuable tool in periodontal diagnostics.^{1,2} Usually 2-D imaging processes, such as bitewing images, intra-oral images of single teeth, or panoramic tomograms, are used for this purpose. All these processes are able to provide important diagnostic pointers, but none of them are without fundamental limitations,³ even at a high quality. It is against this background that cone-beam computed tomography (CBCT) has gained increasing importance over the past few years and is now firmly entrenched in certain areas of modern dentistry.^{4,5} In today's periodontology, CBCT allows for precise answers to a number of diagnostic issues relating to structural bone changes in the dentoalveolar area.¹² High-resolution

and overlap-free imaging of teeth and bone structures, as well as their pathological deterioration, play a major role in diagnostics.^{6,8-10}

_Principle of radiological bone measurement

As there have been no satisfactory software-based solutions existed to date for standardized use in the parodontological evaluation of cross-sectional data (obtained using CBCT or CT), software was developed in collaboration with Straumann under the name of coPeriodontiX and is now presented for the first time in its current version 9.0 (Dental Wings Inc.). The principle of standardised evaluation follows the X-ray six-point measuring principle in analogy to clinical assessment. By positioning a digital 3-D coordinate system centrally on the tooth to be measured, the software automatically generates transverse cross-sections of the tooth (Figs. 1a & b). Using settable, defined landmarks, the distance



along the axis of the tooth is measured automatically at six measuring points circumferentially around the tooth (vestibular and oral, with mesial, central and distal measurements in each case) to give a 360-degree evaluation of crestal bone status. The dentino-enamel junction and crestal alveolar bone serve as reference landmarks (Figs. 2a & b). In the case of multiple-rooted teeth, any possible pathological furcation involvement can be clearly evaluated using a special 360-degree panoramic view and by metrically measuring the degree of furcation involvement (Fig. 3). All findings can be presented individually in graphic or table format as desired (Figs. 4a & b).

Imaging processes in dentistry: 2-D versus 3-D

The main disadvantage of conventional 2-D image processing is the 2-D display of 3-D anatomical structures. Important morphological aspects and their pathological changes to the tooth-supporting alveolar ridge can only be detected at advanced stages of deterioration, or perhaps not at all, owing to overlapping images. The amount of bone available can only be determined with a certain degree of accuracy in the approximal spaces. The detection and quantitative determination of double- to triple-walled bone defects is often a diagnostic challenge, even in the case of high-quality X-ray images.⁷ In this context, coPeriodontiX is intended to be a valuable tool that allows precise and standardised evaluation of 3-D cross-sectional images as part of periodontal diagnostics in addition to the indispensable clinical exploration. The focus is the measurement of available bone mass prior to, during, and after treatment, as well as monitoring following the regenerative treatment of vertical periodontal defects and furcation involvement, for example.

Limitations of CBCT

Artefacts

A major problem with all cross-sectional imaging methods is the generation of image artefacts. Typically, high-density structural elements in the object investigated (e.g. metallic restorations, root pins, implants, osteo-

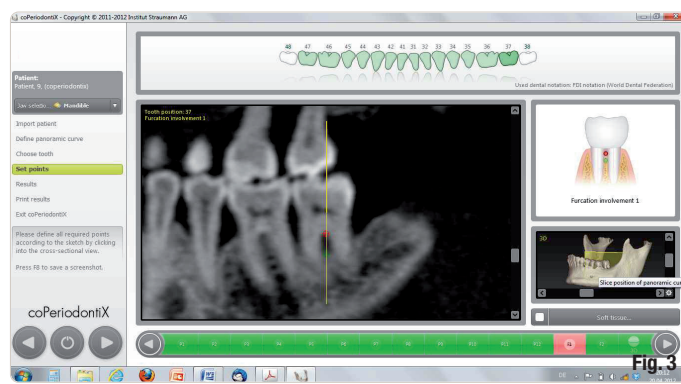


Fig. 3

synthesis plates) lead to obliterating and hardening artefacts in beam direction.¹³ Under certain circumstances, these may impair the diagnostic assessment of directly adjacent structures (e.g. approximal spaces, peri-implant region), and may in part even mimic pathological structures.

Effective radiation dose

The radiation dose for patients undergoing dental CBCT largely depends on the CBCT system, the type of detector used, and the exposition parameters of the X-ray itself. As a rule, image-intensifier systems produce a slightly lower dose than flat-panel detector systems do.¹¹ The effective dose, in terms of risk management, can be reduced considerably by selecting an image volume adjusted to the area of exploration.¹⁴ Scientific studies have shown that the dose¹⁵⁻¹⁸ of CBCT may well be similar to the magnitude of intra-oral film status for a single tooth (with up to 14 individual images) and that CBCT may offer considerably higher information content in direct comparison.⁶ Nonetheless, strict indications according to the ALARA (as low as reasonably achievable) principle should be adhered to under all circumstances when employing CBCT to minimise the exploration risk for the patient.

Imaging accuracy and precision

When defining the precision and measuring accuracy for periodontal diagnostics, a certain degree of deviation between the clinical situation and the resulting radiological information is inevitable but can be regarded as

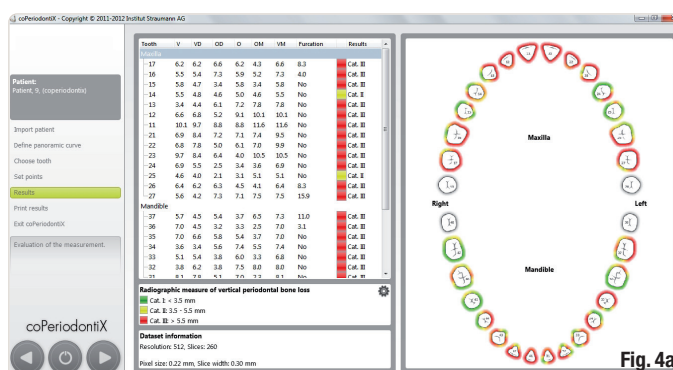


Fig. 4a

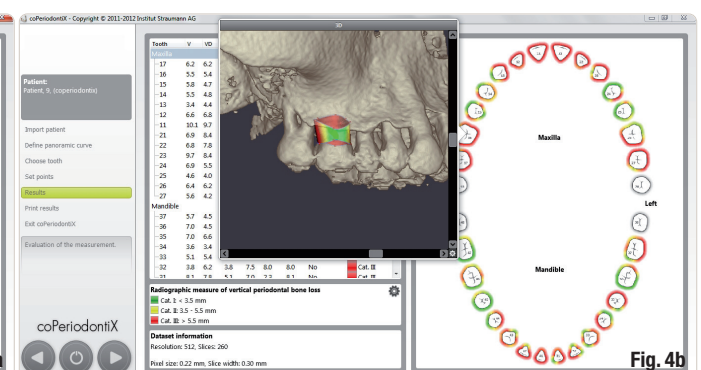


Fig. 4b



being clinically acceptable.^{6,19,21} Regarding the reliability of radiological measurements, initial study results²² showed an overall measuring imprecision of two to three times the voxel size, regardless of the prior knowledge of dental radiology of the users involved. Depending on the number of roots, measuring accuracies of between 0.26 and 0.34 mm have been recorded for single-rooted teeth, and between 0.27 and 0.55 mm for multiple-rooted teeth. The effect of the individual user did not prove to be significant. In principle, these values permit the conclusion that a basic accuracy at this level, compared with measuring imprecision during clinical diagnosis of the patient, can well be considered consistent and regarded as being acceptable from a clinical point of view.

Conclusion

Especially for complex issues, the use of CBCT can be viewed as a valuable diagnostic tool in modern periodontology applying the ALARA principle. The undistorted and non-overlapping 3-D imaging of the tooth-supporting alveolar ridge by methods such as CBCT has significant potential in periodontal diagnostics—under the precondition of robust scientific evidence. In this context, the coPeriodontiX software described in this article is the first to offer support to users in the detection of dental, periodontal, and osseous deterioration, particularly in highly complex cases, and coPeriodontiX may be an interesting option for surgical restoration. Finally, it should be mentioned explicitly that the software described in this article does not replace clinical diagnosis, but should rather be viewed as a useful radiological means of support. This includes the option of portraying the soft tissue of the intra-oral gingival profile using surface scan data obtained with iTero for example (Align Technology; Fig. 5). A number of further clinical studies are being conducted using numerous diagnostic parameters to examine the technical features of current CBCT systems (e.g. image resolution, image quality, creation of artefacts) and to exploit the diagnostic potential of CBCT fully, especially for its use in periodontal diagnostics.

Editorial note: A complete list of references is available from the publisher.

_about the authors

cone beam



Dr Jonathan Fleiner worked in the Division of Oral and Maxillofacial Surgery at the University Medical Center Freiburg of the University of Freiburg in Germany from 2007 until 2009. Between 2007 and 2008, he completed his postgraduate education in implantology through the German Association of Oral Implantology (DGI) and the Academy for Practice and Science (APW). In 2008, he opened the Dental Diagnostic Center (DDZ) in Weil am Rhein, Germany, which focuses on dental CBCT. Since 2008, he has been a regular speaker at national and international events, as well as a reviewer of international scientific journals in the fields of dental radiological diagnostics, CBCT and 3-D template-guided implant treatment (guided surgery). He has worked at the Center for Implantology, Periodontology and 3-D Diagnostics in Constance, Germany, since 2010.



Dr Andres Stricker has a PhD in Dentistry (1997) and in Medicine (2002). Since 2003, he has run a referral practice with a focus on implantology and periodontology in Constance, Germany, and has been a lecturer and scientific staff member at the University Medical Center Freiburg. He has been a lecturer at the Danube University Krems in Austria since 2004. He was a member of numerous research terms in the US between 1998 and 2001. He opened his practice, the Center for Implantology, Periodontology and 3-D Diagnostics, in Constance in 2010. He has written many publications on various topics, including augmentation methods, distraction, immediate loading, tissue engineering, soft-tissue management, and stem cell regeneration. He is an international and national speaker, and holds various licences and patents.



Dr Dirk Schulze was, until 2009, Head of X-ray department at the clinic and polyclinic for oral, maxillofacial and facial surgery at the Albert Ludwig University in Freiburg/Breisgau (Germany). He has run his own practice in Freiburg/Breisgau since 2010. He has written numerous scientific publications and serves as a reviewer. He has been the Secretary of the European Academy of DentoMaxilloFacial Radiology since 2010.



CROIXTURE

PROFESSIONAL MEDICAL COUTURE



EXPERIENCE OUR ENTIRE COLLECTION ONLINE

WWW.CROIXTURE.COM

One-visit guided treatment thanks to CBCT and CAD/CAM

Author _ Dr Josef Kunkela, Czech Republic



Fig. 1



Fig. 2

_Until very recently, my patients would have considered undergoing complete treatment including a ceramic crown or a bridge in one visit science fiction. The science of CAD/CAM technology has progressed at a staggering pace, enabling me to treat a case that represents a new level in the field.

This case report demonstrates a procedure that allows the treatment of a patient who has lost a tooth or had one extracted. In one visit, he or she can receive an implant using a while-you-wait,

made-on-demand implant guide. Furthermore, modelling of the individual abutment or placing of a solid titanium abutment with a temporary crown, or a permanent ceramic crown, based on the indication and diagnosis, can be performed in the same visit.

The implant guide that is produced while the patient waits (CEREC Guide, Sirona) speeds up the entire process incredibly, owing to a precisely mapped location in a 3-D CBCT scan using GALAXIS and GALILEOS Implant (both Sirona) visualisation



Fig. 3



Fig. 4

software. Moreover, it also enables implantation using the flapless technique. Immediate fabrication and use of the implant guide is even more important in immediate implant placement after extraction of multi-rooted teeth, for which free-hand implantation is extremely difficult (or near impossible).

In addition to CEREC Guide, we can order and use the CLASSICGUIDE (SICAT), made on the basis of a conventional impression, or OPTIGUIDE (SICAT), a stent that is manufactured without bite plates and impressions, requiring only a digital scan of the patient's mouth with CEREC AC (Sirona) and a CBCT scan of the patient's jaws (using GALILEOS or ORTHOPHOS XG 3D). Of all three guides that could be used, that is, a pilot drill, sleeve in sleeve or completely guided stents, only CEREC Guide can be produced in office immediately. CEREC Guide was used in the following clinical case report.

Clinical case report

A 55-year-old male patient refused orthodontic treatment to move tooth 13 into proper position while making space for a replacement of tooth 12. The patient had been chewing on primary tooth 53, which was extracted about 14 days before implantation. Figure 1 shows the gap after extracting tooth 53. Tooth 12 was missing and tooth 13 had moved mesially into the space (Fig. 2). Overall, the patient was healthy and had no hereditary disease.

In this case, we began the treatment by taking a conventional impression of the jaw in which we were considering placing an implant to replace a missing tooth. We used quick-setting plaster well suited to

fabricating the stone model (Fig. 3). We placed a reference body in the location of planned implantation on the stone model to determine the correct size (three sizes are available: small, medium and large).

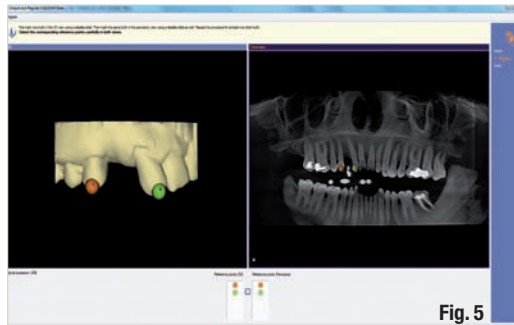


Fig. 5



Fig. 6

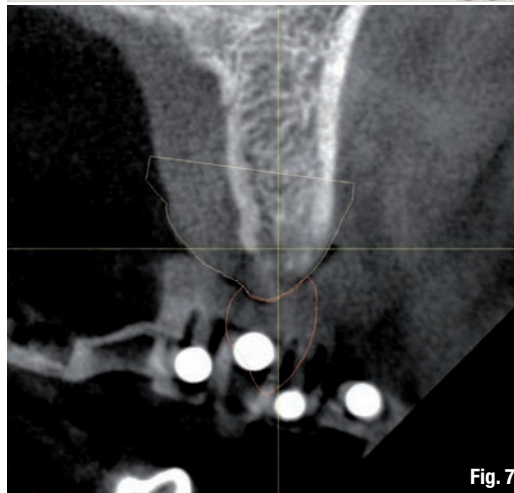


Fig. 7



Fig. 8

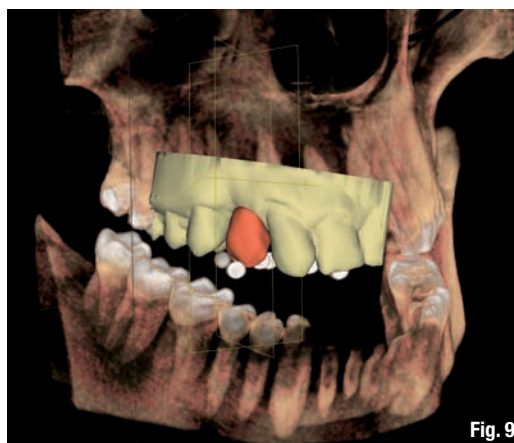


Fig. 9



Fig. 10

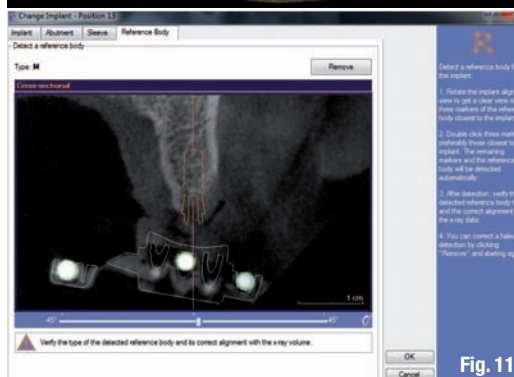


Fig. 11

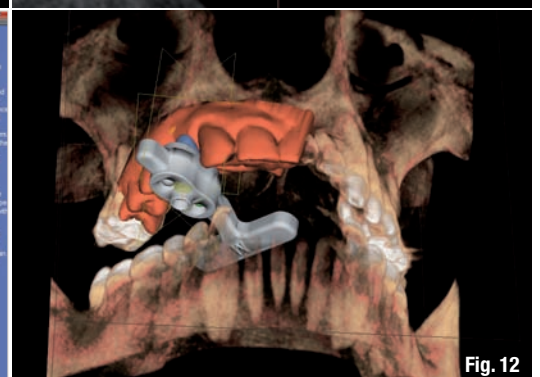


Fig. 12

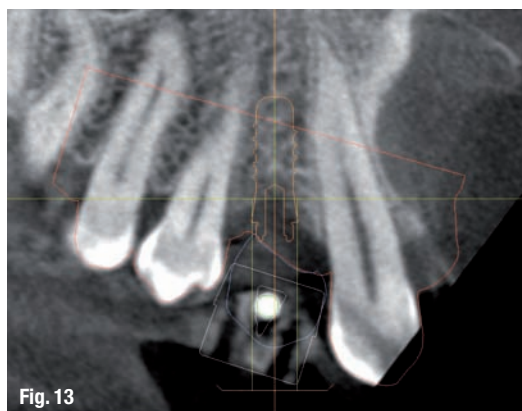


Fig. 13

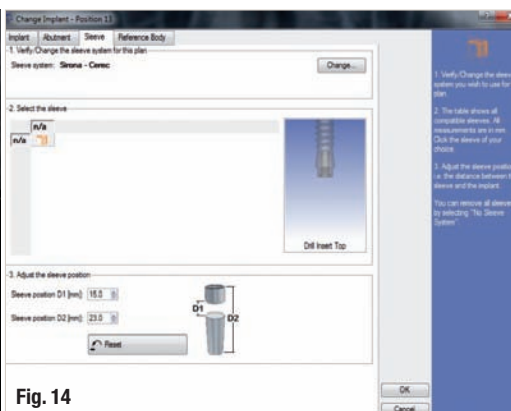


Fig. 14



Fig. 15



Fig. 16

The reference body should abut against the adjacent teeth and fill the gap with the largest possible area but it should not become lodged between the adjacent teeth during placement. Once we had determined the optimal size, we wet the stone model with water and applied thermoplastic stent material softened with warm water to cover one to two adjacent teeth on each side ideally. The properly heated stent compound appears to be glassy/transparent, which by its transparency also indicates plasticity interval. Once the colour changes to opaque, setting has begun. While the stent compound was still warm and adapted to the stone model, we inserted the reference body (medium in this case; Fig. 4). When the thermoplastic is still clear, it is possible to observe and review how the reference body relates to the edentulous space. Corrections can still be

made until the material becomes opaque. Undercuts on the stone model can be blocked out before using, for example, a composite compound (not wax) to allow easier detachment of the thermoplastic stent material with the reference body from the model. Personally, I do not block out undercuts to ensure the most accurate mounting. Even in the ensuing test in the patient's mouth, one must hear the characteristic click sound.

Once satisfied with the placement and retention of the stent with the reference body in the patient's mouth, we captured a CBCT scan of the patient using GALILEOS or ORTHOPHOS XG 3D. One needs to ensure that the large fiducial-containing portion of the reference body faces

orally as depicted in Figure 4 and not buccally in ORTHOPHOS XG 3D, as there may be a tendency to cut this portion off in its 8 × 8 cm field of view. While waiting for the image to load on the PC, we scan the implant space layout on the model using an intra-oral scanner (CEREC AC) and software modelling of the proposed crown follows, in terms of suitable shape, size and location in the future implant position.¹

Once the CBCT scan has loaded, we open the GALAXIS software and begin the planning. The first step is to insert the exported CEREC crown proposal in *.ssi format because this is the only CEREC crown proposal format that GALAXIS software can read (Fig. 5). The exact placement of the proposed CAD/CAM crown in the CBCT scan will allow precise

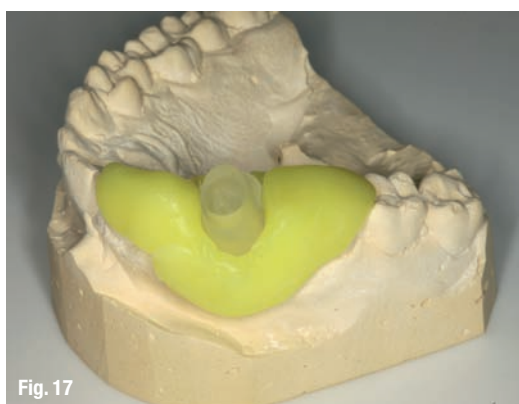


Fig. 17



Fig. 18

read-out of borders between hard and soft tissue (Figs. 6–8) and the digital implant placement under the crown in such a way that the future connection of the implant and crown using an abutment is prosthodontically possible (Fig. 9). After the digital implant had been imported into GALAXIS, the need to use CEREC Guide (or another guided-surgery technique) became apparent in this case owing to a dramatic conical apical narrowing of the roots of the adjacent teeth 14 and 13 in the intended implant space (Fig. 10). Owing to the lack of space between these roots, we chose a 3.3/8 mm implant (SwishPlus, Implant Direct). After digital implant placement, we select to continue and edit the sleeve system. After selecting this option, a new dialog box marked "reference body" appears. On this screen, we mark the fiducial points using the lever underneath the image and move the lever until the fiducials appear to be as round and clear as possible. Finally, we double click on the three most clear fiducial points and the software will then automatically search for and determine the remaining fiducials (Fig. 11). Next, we confirm that the fiducials have been found and the reference body appears on the 2-D and 3-D images (Fig. 12). In order to better visualise the interaction of the drill path and drill body with the implant, the final drill path and pilot drill path must be turned on in the 2-D views (Fig. 13). The reference body must fit exactly within the drill path in order to be milled.

The most important part of CEREC Guide production is setting the D2 value. The D2 value, also

known as the drill stop length, is the distance from the apex of the implant to the top of the guide. If we measure the length of the drill from its cutting tip to the drill stop, the D2 value will be that length minus 1 mm, which is the thickness of the implant guide handle. In our case, for the 8 mm implant used, this value was 23 mm (the 24 mm drill minus the 1 mm handle). The D1 value changes with the D2 value automatically (Fig. 14).

In order to continue, we export this arrangement data back to the CEREC AC unit as a *.cmg or *.dxd file. After opening the correct file in CEREC Software 4.xx, the drill body proposal will appear in the milling preview (Fig. 15). Now we can place the appropriate block size (in our case this was "M") into the milling unit (MCXL on inLab MCXL, Sirona) and select "mill".



Fig. 19

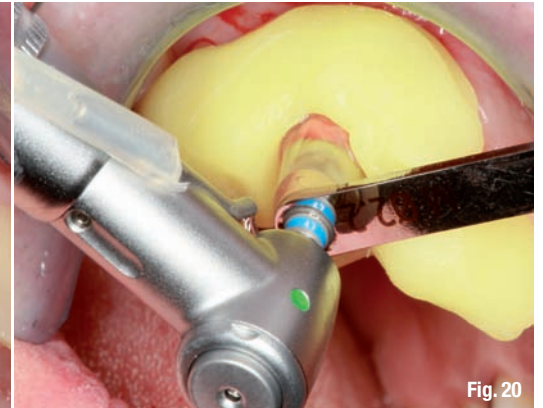


Fig. 20



Fig. 21



Fig. 22



Fig. 23

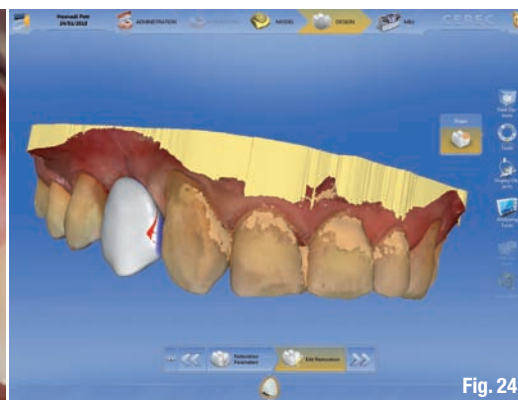


Fig. 24



Fig. 25



Fig. 26

Milling time is approximately 12 to 16 minutes (Fig. 16). We break the drill body out of the block and remove the sprue carefully.

Next, we remove the reference body from the thermoplastic stent and, using a scalper or bur at a very low speed, cut away a thin layer of the thermoplastic material from the bottom of the guide to allow the drill to pass through the guide. When snapping the drill body into the thermoplastic stent, it is important to ensure that the drill body is inserted with the correct vestibulo-oral orientation (Fig. 17).

Sirona produces specific guide handles for each block size (again in small, medium and large) and for several implant guide kits. In our case, we used the guide handles for Straumann for the next step because these handles are compatible with the Implant Direct implant used.

Surgery

We begin with anesthetising the tissue around the work area and placing the cleaned and disinfected CEREC Guide in the mouth, followed by the fit evaluation. The guide should feel secure and not move over the teeth. As we performed the flapless technique, we began by punching the tissue with the appropriate puncher (Fig. 18). We then removed the guide and easily separated and removed the punched tissue (Fig. 19). We placed the CEREC Guide back into position and continued with subsequent drills and guide handles.

Using the guide kit for Straumann (Sirona CEREC Guide Drill Key Set ST), we started with the M 2.2 handle and 2.2 mm pilot drill (Fig. 20), followed by the M 2.8 handle and 2.8 mm drill (Fig. 21). Finally, we removed the CEREC Guide and inserted the 3.3/8 mm SwishPlus implant without the guide, that is, free hand (Fig. 22).

Temporary

We screwed a solid abutment (Implant Direct; Fig. 23) into the inner part of the implant, and covered

the screw-hole with Teflon. This was immediately followed with an intra-oral scan. As scanning powder cannot be used for an unhealed soft-tissue margin, we used the new powder-free CEREC Omnicam camera. Next, we proceeded through the steps of CEREC Software 4.xx (Fig. 24) to mill the temporary crown from a LAVA Ultimate block (3M ESPE; Figs. 25 & 26). While it is acknowledged that dentistry is not Formula One, the patient was very satisfied with a total treatment time of 115 minutes.

Conclusion

This case report has demonstrated the workflow and manufacture of CEREC guides. Anyone interested in this procedure and its processes is invited to visit our training centre in the Czech Republic, where one can view patient surgeries live and participate in a practical demonstration course. For further details and course schedules, please visit www.gototraining.cz.

¹ Important note: If immediate casting of a plaster model is not possible at your practice, it is possible to utilise a hydro-plastic stent material with a reference body of the correct size together with intra-oral scanning of the mouth to be placed directly in the mouth without a stone model.

_contact

cone beam



Dr Josef Kunkela

Czech Society
of CAD/CAM Dentistry
Růžová 41
CZ-37701 Jindřichův Hradec
Czech Republic

Tel.: +420 737 210 565

kunkela@dentalpoint.cz
www.gototraining.cz

THE BUSINESS OF DENTISTRY

REGISTER ONLINE NOW!

Enjoy free entry to the Trade Fair & Conference Early Bird rates



INTERNATIONAL DENTAL EXHIBITION AND MEETING APRIL 4 - 6, 2014

Suntec Singapore International Convention and Exhibition Centre

Pre-Congress Day: April 3, 2014

IDEM Singapore offers an unrivalled opportunity to reach out to the dental fraternity in the Asia-Pacific region. With a powerful combination of an extensive international trade exhibition and a world-class scientific conference, IDEM Singapore has been a cornerstone event in the dental community calendar since 2000. It is a "must-attend" for dental practitioners and professionals in the Asia-Pacific looking for the latest cutting edge technology and innovations in dental solutions and services.

ONE-STOP SHOPPING AND BUSINESS NETWORKING

With more than 450 exhibitors from over 36 countries in one location - See, learn and shop for the latest and best deals in dental technology at IDEM Singapore 2014. For the traders and distribution houses, IDEM Singapore 2014 will also feature many new exhibitors globally, using this exhibition as a platform to seek distributors in Asia. Meet dental professionals from all over the Asia-Pacific region. Establish contacts, exchange ideas and socialise with colleagues both familiar and new from the regional dental fraternity. For a full list of exhibitors, please visit our website. Register online to visit the trade exhibition for free.

A CONTINUAL EDUCATION PROGRAM THAT IS TAILORED TO YOUR NEEDS

In four power-packed days of lectures and workshops, IDEM Singapore 2014 caters to Dentists and the rest of the dental team, including Dental Technicians, Dental Hygienists and Dental Therapists. A diverse range of topics and educational sessions will be presented, so you can tailor a valuable program that is relevant to your needs.

Planned Topics Include:

Regenerative Endodontics • Making "Real World" Practice Productive and Enjoyable • Future of Dental Implants • Developing your Ideal Practice • Multidisciplinary Approach to Periodontal Therapy • Adult Orthodontics Today

Featured Speakers:



Gordon J. Christensen

Founder and Director of Practical Clinical Courses (PCC) and Chief Executive Officer of Clinicians Report Foundation (CR)



Ken Hargreaves

Professor and Chair of Endodontics, University of Texas Health Science Center, USA



Derrick Setchell

Hon. Professor of UCL and Hon. Consultant, Eastman Dental Hospital, UK

For list of speakers and their topics, visit www.idem-singapore.com



#NewDentist Forum

Aside from the main scientific conference, dentists within 7 years of graduating with a dental degree and final year dental students will enjoy two unique and exclusive sessions to provide them with the foundation for success in the early stages of their career.



Dental Technician Forum

This 2-day dedicated program includes groundbreaking lectures from the industry's key opinion leaders, focused entirely on the latest advances in the dental laboratory.

Dental Hygienist and Dental Therapist Forum

Dental Therapists & Dental Hygienists from the region will have the opportunity to learn about new developments in their field, to meet and network with fellow colleagues.

Endorsed By



Supported By



MINISTRY OF HEALTH



SINGAPORE EXHIBITION & CONVENTION BUREAU

Held In



In Co-operation With



Co-organizer



Koelnmesse Pte Ltd

Andrea Berghoff

Tel: +65 6500 6706

a.berghoff@koelnmesse.com.sg

CBCT-assisted implant therapy: A case study

Author _ Dr Nilesh Parmar, UK



Figs. 1 & 2 Pre-op presentation.

Fig. 3 Maximum intensity projection using Sirona GALILEOS.

Fig. 4 A CBCT scan with a CEREC Bluecam overlay showing the ideal final result.

Fig. 5 Stage 1 of implant placement, with healing abutments in place.

_Implant treatment in the anterior mandible has favourable long-term success rates when compared with other areas of the mouth (Gokcen-Rohlig et al. 2009). Placement of dental implants in the interforaminal area is considered a safe and predictable procedure. However, perforation of the lingual cortical plate can result in a profound and potentially life-threatening sublingual bleed (Bucal 2008). The blood

supply to this area is provided by the submental, sublingual and mylohyoid arteries, which if perforated may set off a massive internal haemorrhage in the floor of the mouth.

Although rare, this can ultimately cause protrusion of the tongue, resulting in airway obstruction and necessitating surgical intervention. It has been suggested by Tepper et al. (2001) that CT imaging of this area is warranted for visualising 3-D bone anatomy prior to surgery, thereby reducing the possibility of surgical instrumentation of this sensitive area.

In this case report, I shall show how CBCT coupled with chairside diagnostic imaging can help in planning, simplifying and executing implant placement in the anterior mandible.

_Patient history

A 44-year-old female patient who was undergoing long-term periodontal treatment presented with mobile and painful lower incisors. She exhibited very good oral hygiene but with a periapical area and mobility associated with tooth #14 and Grade II mobility of her lower incisors. The patient described difficulty and embarrassment when eating, owing to the movement of her lower teeth and wanted a fixed solution.

_Clinical examination

The patient had a lightly restored dentition with a thin gingival biotype. As previously mentioned, her

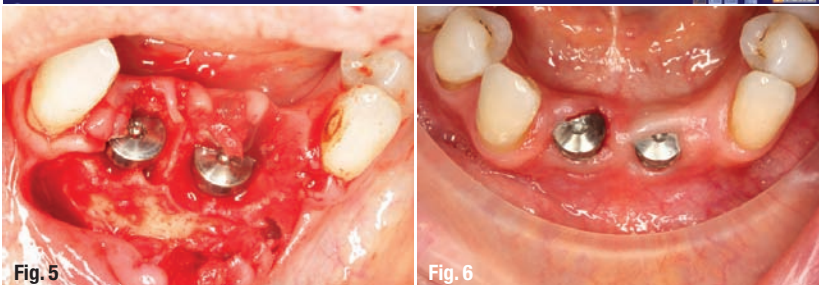
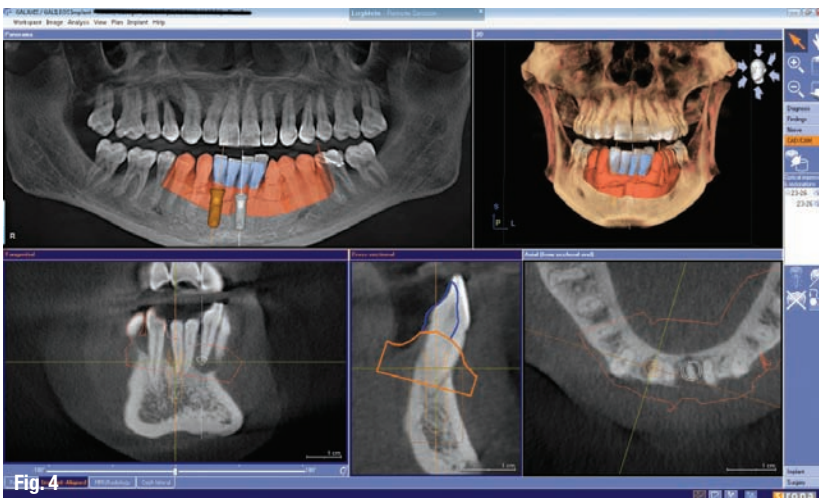


Fig. 6

oral hygiene was good and she was a non-smoker (gave up 11 years previously). She exhibited bilateral canine guidance with no evidence of any para-function. Her BPE scores were 312/231.

_Treatment options

Owing to the patient's history of periodontal disease and associated mobility, she was aware that some form of replacement was necessary. The patient did not want a removable restoration and preferred a fixed solution. In this area of the mouth, either fixed bridgework or an implant-retained prosthesis was possible.

After discussing the options and highlighting the increased risk of peri-implantitis in patients with previous periodontal disease (Esposito 2006), the patient opted for a fixed implant-retained solution. The treatment was to be planned in such a way that if she lost her posterior molars in the future, a full-arch fixed prosthesis could be made after subsequent implant placement.

_Treatment plan

Treatment was to be carried out as follows:

1. continuation of periodontal treatment and oral hygiene advice;
2. CBCT GALILEOS (Sirona) scan to assess bone height, bone profile and associated anatomy;
3. extraction of all four lower incisors and tooth #14;
4. placement of two SLA active implants (Straumann);
5. restoration with a screw-retained four-unit PFM bridge.

_CBCT

It was decided to take a full-volume CBCT scan to further assess the upper teeth and tooth #14 for future implant replacement. The CBCT scan showed excessive bone loss around the anterior incisors with a small area of periapical radiolucency around tooth #31. A cross-sectional view showed thick, well-developed cortical plates with very little lingual concavity. Owing to the good bone height and minimal pathology, immediate implant placement was planned.

Owing to the patient's bone loss, the lower incisors had drifted, giving a less than desirable tooth position. One of the patient's main complaints was the gaps that had appeared between the lower incisors and the uneven appearance of the incisal edges.

To aid implant placement in the correct angulation, a CEREC Bluecam image was taken and ma-



nipulated so that the lower tooth positions were in harmony with the rest of the dentition.

This proposal was then overlaid onto the CBCT scan and was used to facilitate implant planning. The aim was to provide the patient with a screw-retained bridge with access holes through the lingual aspects of the lower incisors, whilst maintaining a sound margin of safety from the lingual cortical plate.

Figs. 6 & 7 Presentation at eight weeks.

Figs. 8 & 9 Laboratory-made screw-retained porcelain bridge on Straumann synOcta abutments.

Fig. 10 The bridge.

Fig. 11 Appearance at fit.

Fig. 12 Pre-op presentation.

Fig. 13 CBCT scan with CEREC integration.

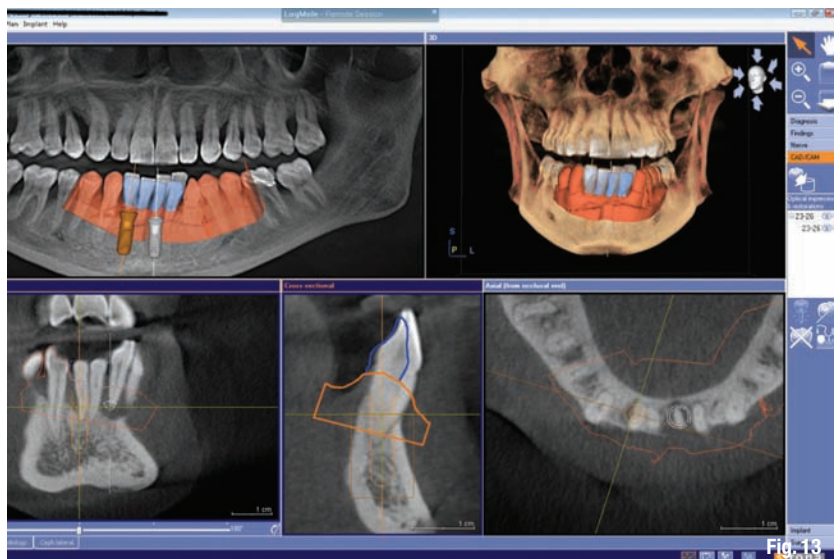




Fig. 14_After eight weeks of healing.

Fig. 15_Insertion of final bridge.

Figs. 16 & 17_Appearance at one month review.

Owing to the patient's previous periodontal history, it was decided to use Standard Plus implants (Straumann) in this case. The design of this implant incorporates a 1.8 mm polished collar above the active surface of the implant. This results in the implant-to-abutment junction being located 1.8 mm superiorly to the bone crest.

_Surgical procedure

The patient was given 400 mg ibuprofen and a chlorhexidine mouth rinse before the surgery began. The procedure was carried out under intravenous sedation using midazolam.

The lower incisors were removed using periostomes and forceps. The sockets were curetted and thoroughly irrigated. A crestal incision with distal relieving incisions was made. Owing to the CBCT scan and surgical stent, only a small lingual reflection was necessary.

Implant placement was carried out using standard ITI protocols. Two SLActive Standard Plus implants (4.1 x 10 mm; Straumann) were placed. The implants exhibited excellent primary stability with an insertion torque of greater than 35 Ncm. The patient's bone quality was estimated to be type D1-2 (Lekholm & Zarb 1985).

Owing to the high primary stability and good bone quality, it was decided to adopt a single-stage surgical protocol, thereby placing healing abutments over the implants. The site was closed using 5-0 PGA sutures and a tooth-supported denture replacing the lower incisors was fitted. Careful examination of the denture was carried out to ensure there was no contact, or transfer of occlusal load onto the implants from the denture. The patient was seen seven days after surgery for suture removal and review.

The patient healed without incident and owing to the favourable lingual undercuts of the lower teeth was able to wear the denture comfortably during the healing process. Owing to financial reasons, the planned implant placement for the tooth #14 site was deferred until a later date.

After eight weeks of healing, fixture-level open-tray impressions were taken in Impregum (3M ESPE), and a four-unit screw-retained bridge was fabricated. The tooth set for the denture was duplicated on the final bridge, as the patient was happy with the tooth size and shape. Owing to the previous bone loss, pink porcelain was added to the bridge to improve the emergence profile and reduce the crown lengths of the lower incisors.

The bridge was seated and torqued to 35 Ncm and composite placed in the access holes. A baseline long-cone periapical radiograph was taken to serve as a baseline for bone-level measurements. The occlusion was checked, with the patient exhibiting canine guidance in excursive movements. The patient was shown how to clean under the bridge using super floss and TePe brushes and placed on a long-term maintenance programme.

_Prognosis

The bridge has a good long-term prognosis, as this patient is highly motivated, and exhibits excellent oral hygiene. She is aware of the increased risk of complications, and the possibility of losing more teeth in the long run, but after having worn a denture for three months, she is determined to avoid becoming a long-term denture wearer. The patient will see me at six-monthly intervals and sees a hygienist every three months for maintenance.

_about the author

cone beam



Dr Nilesh R. Parmar

was voted Best Young Dentist in the East of England in 2009 and runner up in 2010. He was shortlisted at the Private Dentistry Awards in the category of Outstanding Individual 2011 and received

Highly Commended for Best Dentist South at the 2013 Dental Awards. Dr Parmar offers training and mentoring to dentists starting out in implant dentistry, more information can be found on his website www.drnileshparmar.com. Twitter: @NileshRParmar.

Facebook: DR NILESH R. PARMAR

2013 - 2014

INNOVATIVE DENTAL SOLUTIONS GUIDE

UPCOMING EVENTS



www.dental-tribune.com

ALL EVENTS ACCREDITED BY



Centre for Advanced Professional Practices (CAPP) is an ADA CER-P Recognized Provider. ADA CER-P is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CER-P does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.



5th DENTAL - FACIAL COSMETIC INTERNATIONAL CONFERENCE

Joint Meeting with

American Academy of Implant Dentistry, 2nd Global Conference

JUMEIRAH BEACH HOTEL

08-09 NOVEMBER 2013

DUBAI, UAE

www.cappmea.com/aesthetic2013



DENTAL
TECHNICIAN
FORUM

DENTAL TECHNICIAN FORUM *part of IDEM SINGAPORE 2014*

in cooperation with Koelnmesse

SUNTEC INTERNATIONAL CONVENTION & EXHIBITION CENTRE

05-06 APRIL 2014

SINGAPORE

www.idem-singapore.com



CAD/CAM & DIGITAL DENTISTRY INTERNATIONAL CONFERENCE

9th EDITION

09-10 MAY 2014

DUBAI, UAE

www.cappmea.com/cadcam9



4th IRAQI DENTAL REUNION ANNUAL CONFERENCE

Breaking New Opportunities in cooperation with

The 5th International Healthcare Exhibition & Conference Serving Iraq

MAY 2014

ERBIL IRAQ



36th ASIA PACIFIC DENTAL CONGRESS 2014

Event Supporter

17, 18, 19 JUNE 2013

DUBAI, UAE

www.apdentalcongress.org



Dubai Office: Office 1103 | Fortune Executive Tower | JLT | P.O. Box: 450355 | Dubai UAE

T: +971 4 3616174 | F: +971 4 3686883 | M: +971 50 2793711 | E: info@cappmea.com | www.cappmea.com

Singapore Office: 7 Kaki Bukit Road 1 | #03-06 Eunos Techno Link | Singapore 415937

M: +971 55 1128581 | E: deyanov@capp-asia.com | www.capp-asia.com

CBCT in endodontic treatment of fused second and third mandibular molars

Authors_ Dr Andreas Krokidis, Greece, & Dr Riccardo Tonini, Italy

Fig. 1_Initial clinical situation. Observe the plaque in the lingual side in the fusion area and discoloration due to caries.

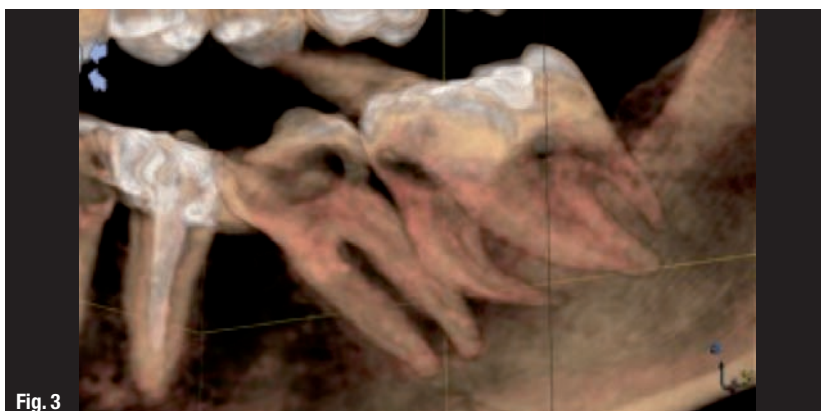
Fig. 2_Initial X-ray situation.



_Abstract

The aim of this article is to report a rare anatomic case and the contribution of new technologies in best resolving it. Fusion is defined as the union of two separate tooth germs at any stage of tooth development. Planning treatment for this condition can be difficult and requires all diagnostic means available. A 45-year-old female patient presenting with a fused second and third molar underwent endodontic treatment and direct restoration after CBCT imaging revealed a direct relationship between the two germs. The treatment was successful once the correct diagnosis had been made.

Fig. 3_Reconstruction.



_Introduction

Fusion is defined as the union of two separate tooth germs at any stage of tooth development. Fused elements may be attached at the dentine or enamel. This process involves the epithelial and mesenchymal germ layers, and results in irregular tooth morphology.¹ Depending on the stage of development in which the fusion occurs, pulp chambers and canals may be linked or separated.

The reason for this phenomenon is unknown, but genetic factors, physical forces, pressure, and trauma may be influencing factors.² The prevalence of dental fusion is higher in primary dentition (0.5–2.5%) than in permanent dentition (0.1%); in both cases, the anterior region has the highest prevalence.³ The incidence is the same between males and females.

Cases of affected posterior teeth are rare in the literature. Most posterior teeth are fused with fourth molars (supernumerary). Fusion between premolars and molars or second and third molars has also been reported, but is less common. In some reported cases, teeth are bilaterally fused with supernumerary molars.^{4–9} In these cases, the number of teeth in the dental arch is also normal and differentiation from gemination is clinically difficult or impossible. A di-

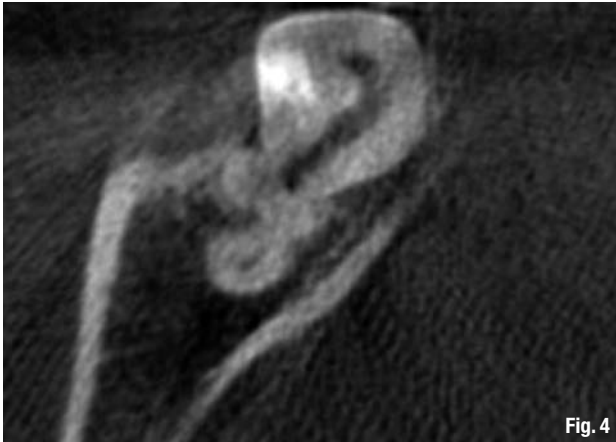


Fig. 4



Fig. 5

agnostic consideration, but not a set rule, is that supernumerary teeth are often slightly aberrant and have a cone-shaped clinical appearance. Thus, fusion between a supernumerary and a normal tooth will generally involve differences in the two halves of the joined crown. However, in gemination cases, the two halves of the joined crown are commonly mirror images.⁹

Periodontic problems occur as a part of the pathology in these cases.⁵⁻⁸ A high prevalence of caries also occurs due to anatomically abnormal plaque retention. In the anterior region, an anti-aesthetic effect occurs owing to the abnormal anatomy. In contrast, crowding and occlusal dysfunction may occur in the posterior region, especially in cases with supernumerary teeth, which often leads to tooth extraction.^{5,10,11}

Fused teeth are usually asymptomatic. The collaboration of practitioners with expertise in multiple areas of dentistry is important to create or achieve functional and aesthetic success in these cases. Several treatment methods have been described in the literature with respect to the different types and morphological variations of fused teeth, including endodontic, restorative, surgical, periodontal, and orthodontic treatment.^{3-6,10-12}

In cases in which endodontic therapy is indicated, clinicians must be very careful during access because anatomy is not predetermined and canals may be displaced from their normal position, depending on the position of the two germs and whether the teeth involved are part of the normal dentition or supernumerary. For this reason, clinicians should examine the element meticulously, both clinically and radiographically. This case report demonstrates the usefulness of a CBCT scan in addition to conventional intra-oral X-rays from different projections in diagnosing and designing appropriate treatment for this rare case.^{13,14}

_Case presentation

A 45-year-old woman was referred by an oral surgeon who had proposed an extraction of the last mandibular molar because of pain and abnormal anatomy. The patient complained of pulsing pain in the right side of the oral cavity, which extended to the ear region and worsened at night.

After a comprehensive extra-oral and intra-oral examination, the pain was found to be localised to the region of teeth 47 and 48 (Fig. 1). Both cold and hot stimuli consistently caused pain in those teeth. An obvious anatomic abnormality noted during the clinical examination was confirmed with intra-oral X-rays

Fig. 4 Axial images where fusion is obvious.

Fig. 5 Access cavity. Non-conventional shape due to abnormal anatomy.



Fig. 6



Fig. 7

Fig. 6 Working length X-ray.

Fig. 7 Finished case.



Fig. 8

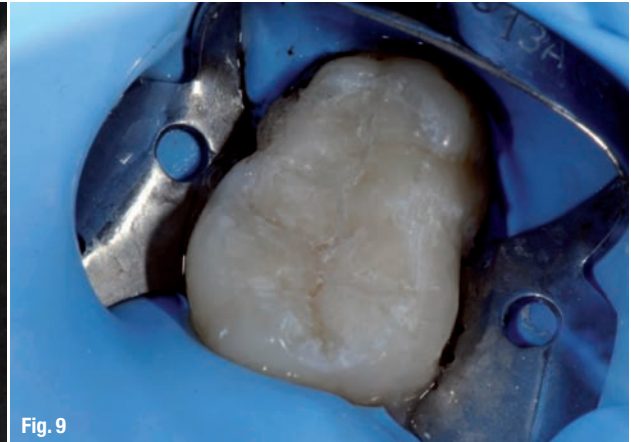


Fig. 9

Fig. 8_X-rays of the finished case.

Fig. 9_After restoration.

using a parallel-cone technique and various projections. The X-ray (Fig. 2) also revealed a deep amalgam restoration extending into the pulp chamber, which had been infiltrated, and distal caries in the fused tooth. A deep carious lesion was also observed on tooth 46, but a simple filling was scheduled because the tooth responded normally to cold and hot stimuli.

In this case, the treatment plan was determined to be root-canal therapy for the pulpitis in the fused tooth and a direct restoration for the same tooth. In addition, dental hygiene sessions were scheduled for the patient because of generalised plaque and to avoid worsening of periodontal conditions in the area of the fused tooth. Direct restorations were also arranged with the general practitioner to avoid any other pulp implications in other teeth with marked infiltrated restorations.

Initially, the treatment plan was targeted at the root-canal therapy of the fused tooth, which was urgent. In order to clarify the anatomy of this element, a CBCT examination was also performed; it revealed two independent mesial roots (lingual and buccal) and a single distal root. The fused root in the middle involved two independent canals ending in the same area (Figs. 3 & 4).

After anaesthetic with 1:100,000 lidocaine had been administered, the tooth was isolated with a rubber dam (KKD, Sympatic Dam). Because of the abnormal anatomy, the use of a liquid photopolymerising dam (DAM COOL, Danville Materials) was necessary to seal gaps completely and to avoid leakage of saliva into the treated tooth and sodium hypochlorite into the patient's mouth. An extended access cavity using a 1.2 mm cylindrical bur and a #2 Start-X ultrasonic tip (DENTSPLY Maillefer) was created to visualise all five orifices (Fig. 5).

Once the surface was clean and canals were visible, negotiation with hand files (K-Files) and PathFiles (DENTSPLY Maillefer) was performed to ensure patency of the canals. First #10 and #08 K-Files (if needed) were alternated along the canals with copious irrigation with sodium hypochlorite and using 17% EDTA gel (B&L Biotech) until the #10 file was at the apex. Working length was measured with an apex locator (Root ZX, Morita). Afterwards #1-3 PathFiles were used until the #3 file reached working length in all five canals. Once patency had been confirmed, working length was also confirmed radiographically (Fig. 6).

The next step was to shape the canals using reciprocating files (WaveOne, DENTSPLY Tulsa Dental

Fig. 10_After restoration.

Fig. 11_One-year recall X-ray.



Fig. 10



Fig. 11

FDI 2014 • New Delhi • India

Greater Noida (UP)

Annual World Dental Congress 11-14 September 2014

**Deadline for
early bird registration
31 May 2014**



A billion smiles welcome the world of dentistry



Fig. 12



Fig. 13

Fig. 12_One-year recall.

Fig. 13_Four-year recall.

Specialties) with a single-file reciprocating technique. Since the anatomy was slightly different, the shaping technique was changed. After the primary file (25.08, red code), apical gauging was performed with manual NiTi K-Files (ISO) to measure the apical restriction diameter. For the distal canal, the large file was also needed. Throughout the procedure, irrigation with preheated 5.25% sodium hypochlorite was performed with 30g irrigating needles (NaviTip, Ultradent) and the irrigant was activated with IrriSafe files (Acteon).¹⁵⁻¹⁷ Once the shaping had been completed, apical diameter was confirmed through apical gauging, and cones were fitted. Irrigation with preheated and activated 17% EDTA solution (Vista Dental Products) was used to remove inorganic debris from the canals. Canals were then dried with paper cones and the roots were sealed with vertical condensation of hot gutta-percha (Endo- α 2 B&L Biotech) with standardised gutta-percha cones and Pulp Canal Sealer. Back-filling was performed with warm liquid gutta-percha (SuperEndo- β B&L Biotech; Figs. 7 & 8). The treatment was completed with a direct composite restoration (Figs. 9 & 10). All treatment was performed under clinical microscope (OMNI pico, Zeiss).

The patient kept to her treatment plan and attended several recall appointments after the root-canal therapy. She also attended six-monthly oral hygiene appointments with the dental hygienist (Figs. 11-13).

_Discussion

Treatment planning for rare conditions such as fused teeth is fundamental to the success of each case. For this reason, clinicians must consider every parameter before starting treatment. In this case, a tooth extraction would have been the likely outcome without a CBCT examination. Because the fused teeth complex did not involve any occlusal or periodontal problems, the extraction would have caused significant biological damage and held significant financial implications.

Once a treatment plan was in place, a CBCT scan was very helpful in determining the exact position of the canals and in designing the access cavity according to the exact anatomy, which was different from that of a normal single tooth. The single-file reciprocating technique chosen for this case was adapted to the need of the tooth. Since the anatomy was complex, the direct use of a large file in the distal root might have failed. Had different diameters been established during apical gauging, the shaping technique would have been changed and more files would have been introduced. For this reason the shaping technique was modified using more files for this particular root.

_Conclusion

In conclusion, this case demonstrates the importance of treatment planning. In designing a treatment plan, all diagnostic methods should be considered. In this case, a CBCT examination resulted in a successful and predictable treatment.

Editorial note: A complete list of references is available from the publisher.

_about the authors

cone beam

Dr Andreas Krokidis is a research associate at the National and Kapodistrian University of Athens in Greece. He can be contacted at andreaskrokidis@hotmail.com

Dr Riccardo Tonini is in private practice in Brescia in Italy.

33^o CIOSP

SÃO PAULO
INTERNATIONAL
DENTAL MEETING

Brazil

JANUARY 22-25, 2015

SÃO PAULO | 2015



www.ciosp.com.br

secretaria.decofe@apcdcentral.com.br

APCD - São Paulo State Dental Association - www.apcd.org.br

Organizer:



Support:



International Media:



Use of CBCT in the diagnosis of cervical spine spondylosis

Authors_Drs Jorma Järnstedt & Prasun Dastidar, Finland

_Introduction

Cone beam computed tomography (CBCT) has been conventionally used to diagnose diseases of the maxillofacial area for many decades. In the past few years sinonasal imaging with CBCT has become popular due to its low radiation dosage. The field of CBCT has received a great deal of R&D attention and consequently, technological progress has been fast and innovations frequent. As a result, the next appropriate area of CBCT imaging seems to be the area of cervical spine ranging from the level of occiput till the level of C7.

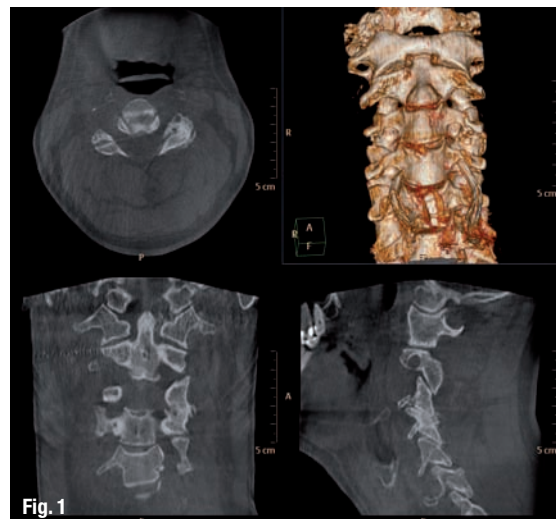


Fig. 1



Fig. 2

Due to the drastic increase of patients with cervical spondylosis and new operative techniques of spondylodesis the need for CT of the cervical spine has significantly increased. Compared to multidetector computed tomography (MDCT) of cervical spine the radiation dose of CBCT of cervical spine is considerably lower (i.e., comparable to AP and lateral views of cervical spine X-ray), but with much more detailed information of the spinal cavity and intervertebral foramina. The extent of false-positive diagnosis of intervertebral foraminal narrowing is dependent on the positioning of the patient in oblique views of the cervical spine. With CBCT of cervical spine this can be avoided.

Indications for a CBCT of the cervical spine are as follows:

- _cervical spine spondylosis leading to spinal stenosis;
- _facet joint arthrosis and associated dislocations;
- _inter-vertebral foraminal stenosis;
- _postoperative analysis of the anterior spondylodesis operations;
- _traumatic fractures;
- _bony tumours and associated destructions.

_SCANORA 3D CBCT system

SCANORA 3D (SOREDEX, Finland) system is a cone beam CT imaging system that is intended for the head and neck area. The unit has been in use at Röntgentutka private clinic in Tampere, Finland, for several years mainly for maxillofacial and sinus diagnostics. Recently the system has been used also for upper cervical spine examinations and has been found extremely useful.

The fields-of-view (H x D) of the unit are 60 x 60 mm, 75 x 100 mm, 75 x 145 mm and 130 x 145 mm, and they are selectable according to the diagnostic task at hand. SCANORA 3D provides a seated patient platform and the region of interest can be freely located in the head and neck area thanks to motorized movements and laser lights. The voxel sizes for adjusting the spatial resolution are selectable in the range of 133–350 μ m. The protocol can be optimized for each diagnostic task to produce proper image quality at minimum radiation dose.

The cervical spine can be scanned starting at level occiput till C7. The field of view is 130–145 mm. The voxel size is 0.3 mm, and the amount of radiation dose can be lower than recommended for example of that of the head and neck area. With CBCT this area can be well demonstrated depending on the patient anatomy: in severe obesity cases the level of C7/T1 could be difficult to demonstrate without technical innovations. At SCANORA 3D the patient is stable in anatomically optimal sitting position and the mandible is in a comfortable, optimal position resting on a plastic stand. In contrast, with MDCT scanning the patient is in a lying position, which changes the physiological position of the cervical spine.

_Case presentation

Case 1

A middle-aged male patient was presented with symptoms of radiating pain in the left cervical region radiating towards left upper limb. In addition, he had movement restrictions of the neck on the left side. He had also noticed a bony lump in the left upper neck area. He consulted his neurosurgeon who referred the patient directly to CBCT of the cervical spine. On CBCT at level C3-C4 spondylotic hypertrophy of the left facet joint was found, which led to lateral stenosis of the intervertebral foramen in addition to a bony prominence on the left side (Fig. 1). Axial, coronal and sagittal slices in addition to surface reconstructions show the changes in details. The patient is now awaiting his surgery, i.e. facetectomy at level C3-C4 after an ENMG examination to rule out nerve degeneration.

Case 2

A middle-aged female patient was referred to CBCT of the cervical spine for restricted neck movements and mild radiating pain to both upper limbs. Also a history of giddiness was elucidated. Cervical spondylosis was suspected. On CBCT images, axial, coronal and sagittal slices in addition to surface reconstructions show mild arthrosis of the bilateral facet joints at upper cervical spine and posterolateral spondylosis at level C3-C6 (Fig.2). Minimal narrowing of the bilateral intervertebral foramina may be noticed. The patient is currently undergoing medical treatment for spondylosis.

Case 3

A middle-aged female patient was referred to CBCT of the cervical spine for severe radiating pain of both upper limbs. A diagnosis of cervical spondylosis with inter-vertebral foraminal narrowing was suspected. On CBCT axial, coronal and sagittal images showed severe bilateral intervertebral stenosis at level C4-C5 (Fig. 3). The patient is awaiting an ENMG examination after which she will undergo a surgery.

_Conclusion

At our clinic we have found the oblique views of plain radiographs not to be optimal enough to demonstrate the condition of intervertebral foramina. These radiographs are neither selective nor sensitive. In all cases of radicular pain of the upper limbs we recommend the simultaneous use of CBCT and MRI for pre-surgical evaluation.

CBCT with its low radiation dose is suitable for demonstration of cervical spondylosis and associated complications. Ventrolateral and posterolateral spondylosis leading to spinal and lateral stenosis may be well demonstrated during presurgical evaluation. Also rheumatic conditions of the upper cervical spine including atlanto-axial dislocation are well indicated by CBCT. Moreover, hair line fractures of the cervical spine and bony lytic tumors are well demonstrated by using CBCT. As a conclusion, we suggest that CBCT of the cervical spine should be routinely indicated for patients referred to surgical intervention.

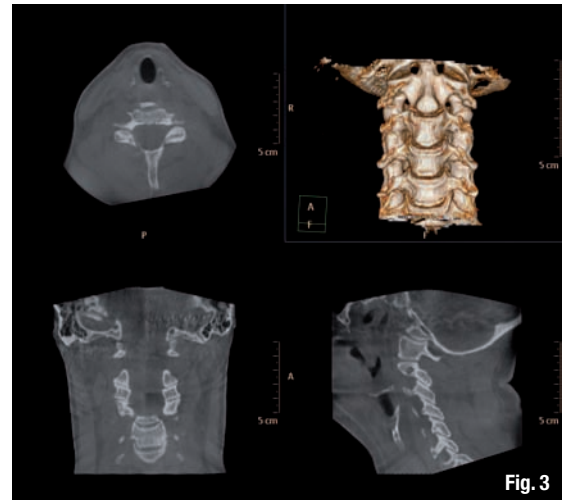


Fig. 3

SCANORA 3D is a registered trademark of SOREDEX.

_References

1. Paik NC. Bilateral cervical spondylolysis of C7. The Spine Journal 2010 Nov;10(11):e10-3.
2. Griffith B, Vallee P, Krupp S, et al. Screening Cervical Spine CT in the Emergency Department, Phase 3: Increasing Effectiveness of Imaging. Journal of the American College of Radiology 2013 Sep 10. pii: S1546-1440(13)00311-6.
3. Järnstedt J, Dastidar P, Linnosaari M. ENT diagnostic imaging using cone beam CT. Medical Imaging 2012 March/April, pp. 24-25.

_about the authors

cone beam

Dr Jorma Järnstedt, DDS, specialist in dento-maxillofacial radiology at Tampere University Hospital and Röntgentutka Corporation, Tampere, Finland.

Dr Prasun Dastidar, MD, PhD, Neuroradiologist at Tampere University Hospital and Röntgentutka Corporation, Tampere, Finland.

Röntgentutka Corporation is a renowned private imaging center located in Tampere, Finland. The clinic provides e.g. MRI, X-ray, ultrasound, CBCT, dental and mammography examinations performed by modern equipment with latest technological innovations and by experienced medical professionals.

SOREDEX focuses on developing innovative imaging solutions that enhance diagnostic performance for healthcare professionals. SOREDEX medical imaging systems are developed in close co-operation with leading ENT and dento-maxillofacial specialists at universities and hospitals around the world.

www.soredex.com

New endodontic imaging mode from Planmeca yields detailed images without noise or artefacts



Planmeca has introduced a new imaging mode specially developed for use in endodontics and that is ideal for cases dealing with small anatomical details, such as imaging of the ear. The new imaging mode is available for all Planmeca ProMax 3D family units and provides perfect visualisation of even the smallest anatomical details. The program produces extremely high-resolution images with a very small voxel size (only 75 µm). Owing to the intelligent Planmeca AINO noise removal and Planmeca ARA artefact removal

algorithms, noise-free and crystal-clear images are produced.

Planmeca ARA removes artefacts efficiently

Metal restorations and root fillings in the patient's mouth can cause shadows and streaks in CBCT images. The intelligent Planmeca ARA Artefact Removal Algorithm removes these artefacts efficiently from Planmeca ProMax 3D images.

Planmeca AINO removes noise from CBCT images

A particularly low radiation dose or small voxel size can cause noise in 3-D X-ray images. The new Planmeca AINO Adaptive Image Noise Optimiser is an intelligent noise filter that reduces noise in CBCT images without losing valuable details. The filter improves image quality in the endodontic imaging mode, where noise is inherent due to the extremely small voxel size. It is especially useful when used in accordance with the Planmeca Ultra Low Dose protocol, where noise is induced by the particularly low dose. Planmeca AINO also allows the reduction of exposure values and consequently the radiation dose in all other imaging modes.

_contact

cone beam

Planmeca Oy
Asentajankatu 6
00880 Helsinki, Finland
www.planmeca.com

implants

international magazine of oral implantology



You can also subscribe via
www.oemus.com/abo



Subscribe now!

One issue free of charge!

☐ I hereby agree to receive a free trial subscription of **implants international magazine of oral implantology** (4 issues per year).

I would like to subscribe to **implants** for € 44 including shipping and VAT for German customers, € 46 including shipping and VAT for customers outside of Germany, unless a written cancellation is sent within 14 days of the receipt of the trial subscription. The subscription will be renewed automatically every year until a written cancellation is sent to OEMUS MEDIA AG, Holbeinstr. 29, 04229 Leipzig, Germany, six weeks prior to the renewal date.

▶ **Reply** via Fax +49 341 48474-290 to OEMUS MEDIA AG or via E-mail to grasse@oemus-media.de

Last Name, First Name

Company

Street

ZIP/City/County

E-mail

Signature

Notice of revocation: I am able to revoke the subscription within 14 days after my order by sending a written cancellation to OEMUS MEDIA AG, Holbeinstr. 29, 04229 Leipzig, Germany.

Signature

Holbeinstr. 29, 04229 Leipzig, Germany, Tel.: +49 341 48474-0, Fax: +49 341 48474-290, E-Mail: grasse@oemus-media.de

OEMUS MEDIA AG



International Congress on 3D Dental Imaging

Boston Photo: Sean Pavone

i-CAT and Henry Schein Dental held the fall session of the 7th International Congress on 3D Dental Imaging from 25 to 26 October 2013 in Boston. According to organizers, this session informed, inspired and educated general dentists and specialists on the benefits of cone beam imaging for the modern-day dental practice.

Experienced professionals delved into the many applications of 3-D dentistry for implants, orthodontics, TMD and airway diagnosis, oral and maxillofacial surgery and periodontics.

3-D technology has already become a valuable tool for facilitating efficiency and accuracy of treatment planning for a more precise implementation by the doctor. This educational opportunity allowed dental practitioners to experience real-world utilization of this technology.

Lectures ranged from basic information sessions to detailed clinical use and hands-on training with 3-D planning software programs. Attendees heard from knowledgeable industry experts and colleagues who shared their perspectives on real 3-D imaging applications during main podium lectures and breakout sessions. To maximize the learning opportunities at the conference, small group sessions allowed attendees to meet, socialize, and exchange insights with the experts in cone beam 3-D imaging.

Clinicians also benefited from networking opportunities with colleagues from around the world. Partners and vendors demonstrated 3-D imaging tools and options, supporting 3-D products for imaging, implant, restorative systems, orthodontics and 3-D treatment-planning software.

"It is clear that we are all very passionate about our involvement with CBCT imaging, as evidenced by the exceptional presentations representing the state-of-the-art modalities combined with the positive interactions and feedback from partici-





pants who attended the Boston 3D Congress," said Dr Scott Ganz, one of the speakers.

According to organizers of the event, one attendee was delighted to discover that he was the winner of the \$50,000 off of an i-CAT FLX Sweepstakes. Dr Stephen Dunn is a firm believer in educating his patients, allowing them to make the best treatment decisions for their oral health. His new i-CAT FLX will be instrumental in providing him with the detailed information needed for such procedures as implants and sleep dentistry, event organizers said.

Dunn noted, "My passion for dentistry has encouraged me to pursue knowledge so that I can look at each patient from many different perspectives and allow the patient many avenues of treatment in order to achieve excellent oral health and function."

The i-CAT FLX offers the treatment tools and flexible imaging options to help him attain his goal while delivering 3-D imaging at lower radiation dose than a typical 2-D panoramic X-ray, according to organizers of the event.

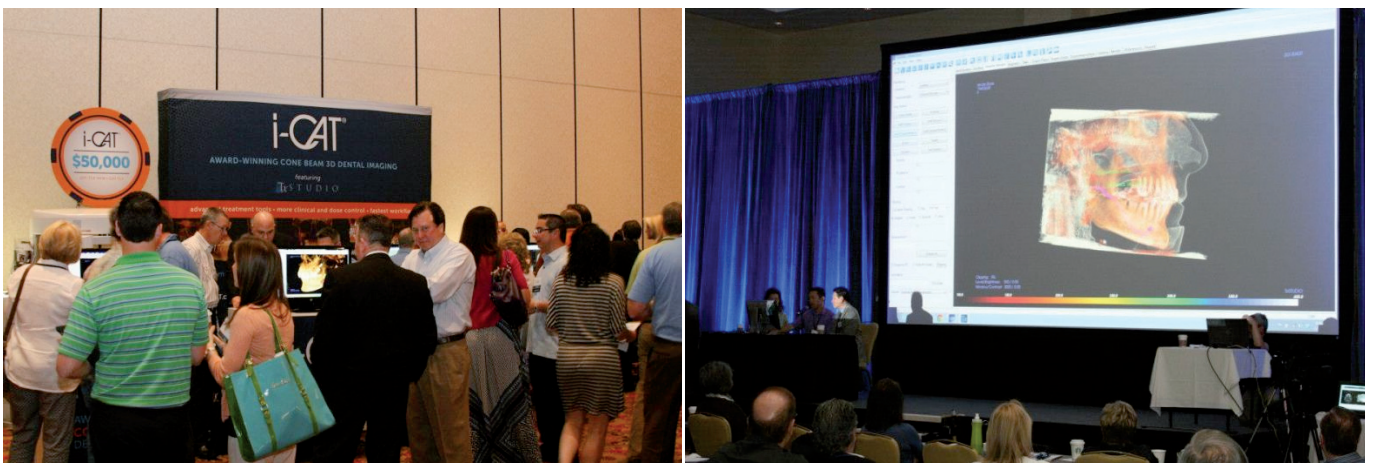
"When a clinician can operate more effectively and efficiently, both the dentist and the patient benefit," said Matt Garrett, vice president of marketing for i-CAT. "Education on 3-D technology can help to achieve this goal. To that end, we are proud that this well-respected educational event has completed its seventh year."

The International Congress on 3D Dental Imaging can help expand the dental landscape for those at any stage in learning about 3-D dentistry — from those researching the technology all the way to advanced users, according to organizers of the event.

The next meeting will be held from 11 to 12 April 2014 in Las Vegas, USA. According to organizers, the 8th International 3D Congress on 3D Dental Imaging will provide participants with lectures and demonstrations of real 3-D imaging applications in dentistry. More information is available by visiting www.i-cat.com.

Source: i-CAT 3D Dental Imaging.

All photos courtesy of i-CAT 3D Dental Imaging.



International Events

2014

IMAGINA Dental
3rd 3-D & CAD/CAM Digital Dentistry Congress
13–15 February 2014
Monaco
www.imaginadental.org

8th International Congress on 3D Imaging
11–12 April 2014
Las Vegas, USA
www.i-cat.com

ITI World Symposium
24–26 April 2014
Geneva, Switzerland
www.iti.org

9th CAD/CAM & Digital Dentistry International Conference
9 & 10 May 2014
Dubai, UAE
www.cappmea.com

EAED 28th Annual Meeting
29–31 May 2014
Athens, Greece
www.eaed.org

ISRRT World Congress
12–15 June 2014
Helsinki, Finland
www.isrrt2014.fi

APDC 36th Asia Pacific Dental Congress
17–19 June 2014
Dubai, UAE
www.apdentalcongress.org

18th World Congress on Dental Traumatology
19–21 June 2014
Istanbul, Turkey
www.iadt-dentaltrauma.org

IACA 2014 Annual Meeting
24–26 July 2014
Bahamas
www.theiaca.com

AAED 39th Annual Meeting
5–8 August 2014
Santa Barbara, USA
www.estheticacademy.org

FDI Annual World Dental Congress
11–14 September 2014
New Delhi, India
www.fdi2014.org.in

155th ADA Annual Session
9–12 October 2014
San Antonio, USA
www.ada.org

EAO 2014
16–19 October 2014
Rome, Italy
www.eao.org



Las Vegas. Photo: iStock

submission guidelines:

Please note that all the textual components of your submission must be combined into one MS Word document. Please do not submit multiple files for each of these items:

- _ the complete article;
- _ all the image (tables, charts, photographs, etc.) captions;
- _ the complete list of sources consulted; and
- _ the author or contact information (biographical sketch, mailing address, e-mail address, etc.).

In addition, images must not be embedded into the MS Word document. All images must be submitted separately, and details about such submission follow below under image requirements.

Text length

Article lengths can vary greatly—from 1,500 to 5,500 words—depending on the subject matter. Our approach is that if you need more or less words to do the topic justice, then please make the article as long or as short as necessary.

We can run an unusually long article in multiple parts, but this usually entails a topic for which each part can stand alone because it contains so much information.

In short, we do not want to limit you in terms of article length, so please use the word count above as a general guideline and if you have specific questions, please do not hesitate to contact us.

Text formatting

We also ask that you forego any special formatting beyond the use of italics and boldface. If you would like to emphasise certain words within the text, please only use italics (do not use underlining or a larger font size). Boldface is reserved for article headers. Please do not use underlining.

Please use single spacing and make sure that the text is left justified. Please do not centre text on the page. Do not indent paragraphs, rather place a blank line between paragraphs. Please do not add tab stops.

Should you require a special layout, please let the word processing programme you are using help you do this formatting automatically. Similarly, should you need to make a list, or add footnotes or endnotes, please let the word processing programme do it for you automatically. There are menus in every programme that will enable you to do so. The fact is that no matter how carefully done, errors can creep in when you try to number footnotes yourself.

Any formatting contrary to stated above will require us to remove such formatting before layout, which is very time-consuming. Please consider this when formatting your document.

Image requirements

Please number images consecutively throughout the article by using a new number for each image. If it is imperative that certain images are grouped together, then use lowercase letters to designate these in a group (for example, 2a, 2b, 2c).

Please place image references in your article wherever they are appropriate, whether in the middle or at the end of a sentence. If you do not directly refer to the image, place the reference at the end of the sentence to which it relates enclosed within brackets and before the period.

In addition, please note:

- _ We require images in TIF or JPEG format.
- _ These images must be no smaller than 6x6 cm in size at 300 DPI.
- _ These image files must be no smaller than 80 KB in size (or they will print the size of a postage stamp!).

Larger image files are always better, and those approximately the size of 1 MB are best. Thus, do not size large image files down to meet our requirements but send us the largest files available. (The larger the starting image is in terms of bytes, the more leeway the designer has for resizing the image in order to fill up more space should there be room available.)

Also, please remember that images must not be embedded into the body of the article submitted. Images must be submitted separately to the textual submission.

You may submit images via e-mail, via our FTP server or post a CD containing your images directly to us (please contact us for the mailing address, as this will depend upon the country from which you will be mailing).

Please also send us a head shot of yourself that is in accordance with the requirements stated above so that it can be printed with your article.

Abstracts

An abstract of your article is not required.

Author or contact information

The author's contact information and a head shot of the author are included at the end of every article. Please note the exact information you would like to appear in this section and format it according to the requirements stated above. A short biographical sketch may precede the contact information if you provide us with the necessary information (60 words or less).

Questions?

Magda Wojtkiewicz (Managing Editor)
m.wojtkiewicz@dental-tribune.com

cone beam

international magazine of cone beam dentistry

dti Dental
Tribune
International

Publisher

Torsten R. Oemus
t.oemus@dental-tribune.com

Editor-in-Chief

Dr Scott D. Ganz
drganz@drganz.com

Managing Editor

Magda Wojtkiewicz
m.wojtkiewicz@dental-tribune.com

Executive Producer

Gernot Meyer
g.meyer@dental-tribune.com

Designer

Franziska Dachsel
f.dachsel@dental-tribune.com

Copy Editors

Sabrina Raaff
Hans Motschmann

International Administration

Marketing & Sales
Esther Wodarski
e.wodarski@dental-tribune.com

Executive Vice President

Finance
Dan Wunderlich
d.wunderlich@dental-tribune.com

Printed by

Löhnert Druck
Handelsstraße 12
04420 Markranstädt, Germany

International Media Sales

Matthias Diessner
m.diessner@dental-tribune.com

Europe

Melissa Brown
m.brown@dental-tribune.com

Asia Pacific

Peter Witteczek
p.witteczek@dental-tribune.com

The Americas

Jan M. Agostaro
j.agostaro@dental-tribune.com

International Offices

Europe

Dental Tribune International GmbH
Contact: Esther Wodarski
Holbeinstr. 29, 04229 Leipzig, Germany
Tel.: +49 341 48474-302
Fax: +49 341 48474-173

Asia Pacific

Dental Tribune Asia Pacific Ltd.
Contact: Tony Lo
Room A, 26/F, 389 King's Road
North Point, Hong Kong
Tel.: +852 3113 6177
Fax: +852 3113 6199

The Americas

Dental Tribune America, LLC
Contact: Anna Włodarczyk
116 West 23rd Street, Suite 500
NY 10011, New York, USA
Tel.: +1 212 244 7181
Fax: +1 212 244 7185

Editorial Board

Dr David Hatcher, USA
Dr Jack Krauser, USA
Uli Hauschild, Italy
Dr Henriette Lerner, Germany
Dr Roberto Marra, Italy
Dr Ziv Mazor, Israel
Sabine Nahme, USA
Dr Alvaro Ordonez, USA
Dr Marco Rinaldi, Italy
Dr Mitra Sadramelli, Canada
Dr Tiziano Testori, Italy
Dr Gerlig Widmann, Austria

cone beam

international magazine of cone beam dentistry
is the official publication of:



www.conebeamcampus.com

www.dental-tribune.com

Copyright Regulations

_cone beam international magazine of cone beam dentistry is published by Dental Tribune Asia Pacific Ltd. and will appear in 2014 with four issues. The magazine and all articles and illustrations therein are protected by copyright. Any utilisation without the prior consent of editor and publisher is inadmissible and liable to prosecution. This applies in particular to duplicate copies, translations, microfilms, and storage and processing in electronic systems.

Reproductions, including extracts, may only be made with the permission of the publisher. Given no statement to the contrary, any submissions to the editorial department are understood to be in agreement with a full or partial publishing of said submission. The editorial department reserves the right to check all submitted articles for formal errors and factual authority, and to make amendments if necessary. No responsibility shall be taken for unsolicited books and manuscripts. Articles bearing symbols other than that of the editorial department, or which are distinguished by the name of the author, represent the opinion of the afore-mentioned, and do not have to comply with the views of Dental Tribune Asia Pacific Ltd. Responsibility for such articles shall be borne by the author. Responsibility for advertisements and other specially labeled items shall not be borne by the editorial department. Likewise, no responsibility shall be assumed for information published about associations, companies and commercial markets. All cases of consequential liability arising from inaccurate or faulty representation are excluded. General terms and conditions apply, legal venue is North Point, Hong Kong.

cone beam

international magazine of cone beam dentistry



Subscribe now!

I would like to subscribe to **cone beam** (4 issues per year) for €44 including shipping and VAT for German customers, €46 including shipping and VAT for customers outside Germany, unless a written cancellation is sent within 14 days of the receipt of the trial subscription. The subscription will be renewed automatically every year until a written cancellation is sent to Dental Tribune International GmbH, Holbeinstr. 29, 04229 Leipzig, Germany, six weeks prior to the renewal date.

► **Reply** via Fax +49 341 48474-173 to Dental Tribune International GmbH or per E-mail to info@dental-tribune.com

Last Name, First Name

Company

Street

ZIP/City/County

E-mail

Signature

Notice of revocation: I am able to revoke the subscription within 14 days after my order by sending a written cancellation to Dental Tribune International GmbH, Holbeinstr. 29, 04229 Leipzig, Germany.

Signature

Planmeca ProMax® 3D

Endodontic imaging mode – a new era in precision



Perfect visualisation of the finest details

- Extremely high resolution with 75 µm voxel size
- Noise-free images with intelligent Planmeca AINO™ filter
- Artefact-free images with efficient Planmeca ARA™ algorithm

Other unique features in Planmeca ProMax® 3D family units:



Ultra low dose imaging

CBCT imaging with an even lower patient dose than panoramic imaging.

Adult female, FOV Ø200 x 180 mm
Effective dose **14.7 µSv**
Planmeca ProMax® 3D Mid



Create your virtual patient

A world first:
One imaging unit,
three types of 3D data.
All in one software.

CBCT + 3D model scan + 3D face photo

Find more info and your local dealer www.planmeca.com

PLANMECA



Planmeca Oy Asentajankatu 6, 00880 Helsinki, Finland. Tel. +358 20 7795 500, fax +358 20 7795 555, sales@planmeca.com, www.planmeca.com