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the international C.E. magazine of oral implantology

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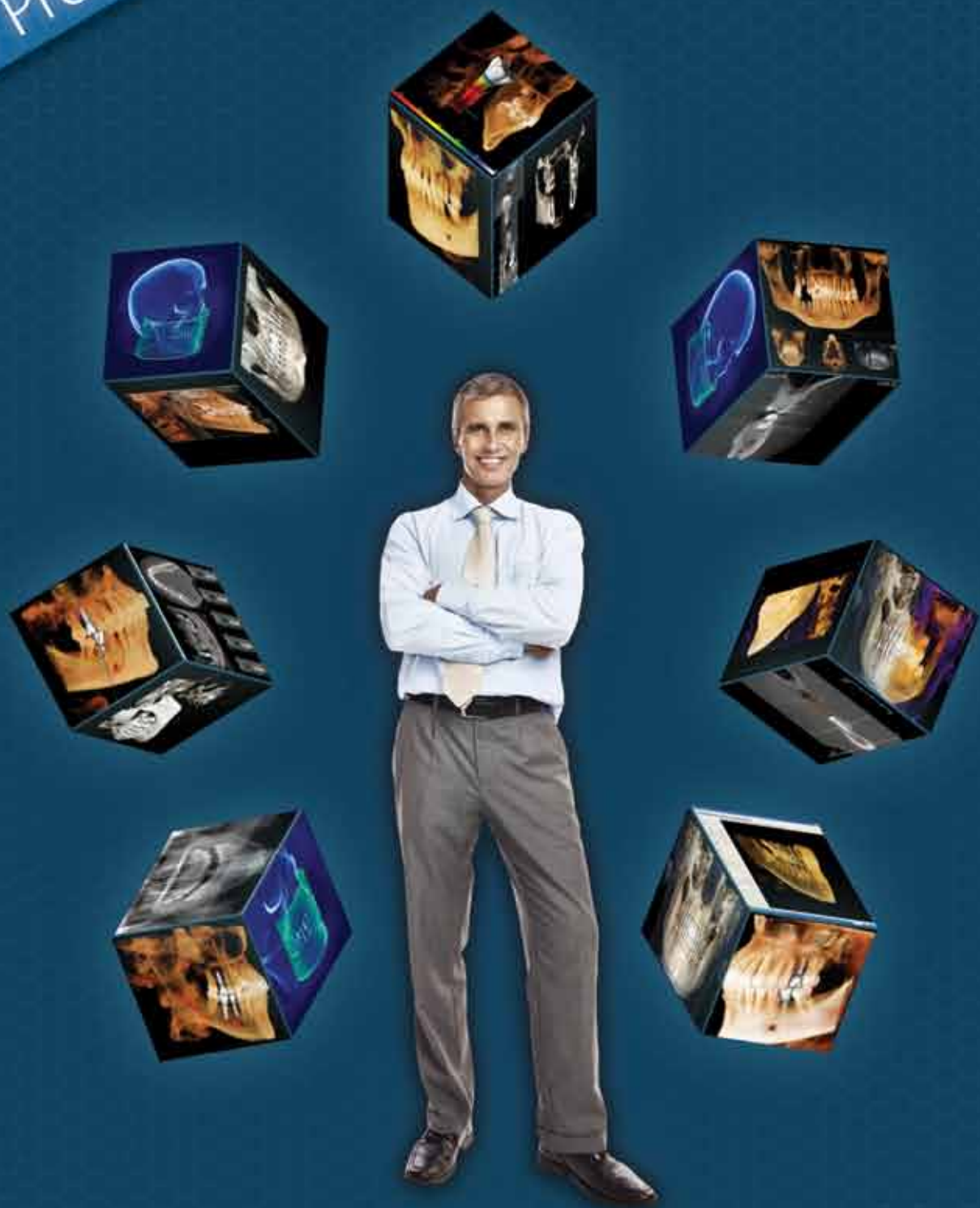
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The goal of this quarterly magazine is twofold. First, it seeks to share practical dental knowledge that can be put to use in your day-to-day practice. Second, it is a vehicle to help you chip away at your continuing education (C.E.) requirements.

The amount of new information available in the dental field about new products, techniques and research data is astounding. Running a practice and seeing patients leaves little time for catching up on the latest clinical news and product information. Thus, we hope *implants* will not only be a welcome respite for those rare chunks of time you can devote to leisurely reading, but one that provides a practical return on your investment by providing information that you can actually put to immediate use.

In addition, we know that taking time away from the practice to pursue C.E. credits is costly in terms of lost revenue and time. As a quarterly magazine, *implants* is here to help you chisel at least four C.E. credits per year out of your already busy life without the lost revenue and time away from your practice. To that end, every edition of *implants* will include at least one hour of ADA CERP-certified C.E. credit where readers can answer questions about the materials at www.dtstudyclub.com to earn this credit. Annual subscribers to the magazine (\$50) need only register at the Dental Tribune Study Club website to access these C.E. quizzes free of charge. In fact, even non-subscribers may take the C.E. quiz after registering on the DT Study Club website and paying a nominal fee.

If you are a practitioner with a penchant for words, it might also interest you to know that authors of the C.E.-accredited articles receive 15 percent of the fees collected from the non-subscribers who take the C.E. quiz online. The C.E. quiz for the articles in this edition will be available online on Nov. 9.

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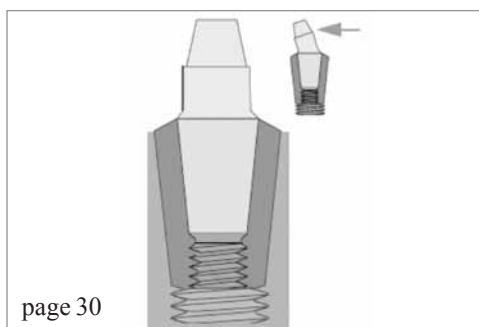
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The etiology of various types of failure modes in oral implantology

Author_Dov M. Almog, DMD

_c.e. credit part I

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To date, the diagnostic realm of pre-operative examination in oral implantology has been frequently reviewed and researched. In this article we will discuss the possible etiology and diversity of potential implant failures associated with confining our pre-operative examination to two-dimensional radiographic images rather than cone-beam computed tomography (CBCT) three-dimensional based dental imaging technologies.

In recent years, CBCT dental imaging technologies have started to make big inroads into every discipline in our profession, expanding the horizons of clinical dental practice by adding a third dimension to craniofacial treatment planning. CBCT-based dental imaging captures a volume of data, and through a reconstruction process, it constructs images that do not contain distortion, magnification and/or overlap of anatomy.

In the same slices, different views are feasible with one exposure, taking the guesswork out of oral implantology.

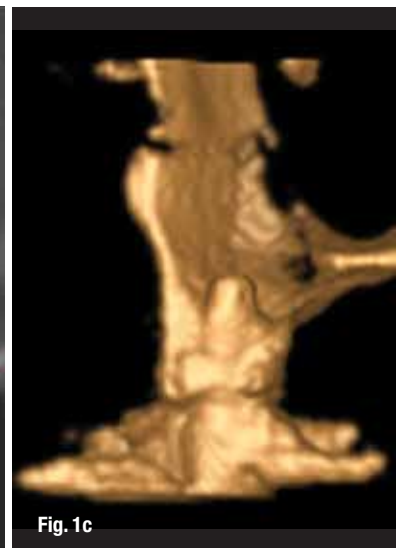
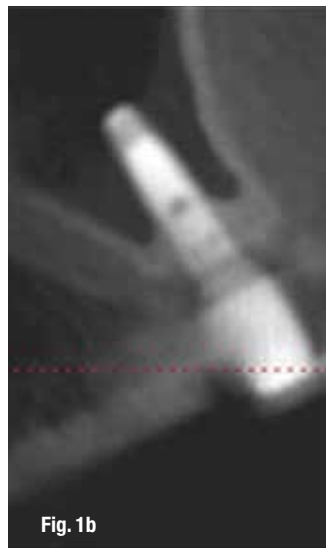
Additionally, these imaging systems' effective radiation doses, measured in Microsieverts are much lower in dose compared to a full mouth series of periapical radiographs (digital or even D speed film). According to dental practitioners who are placing implants, using this technology also makes them more proficient.

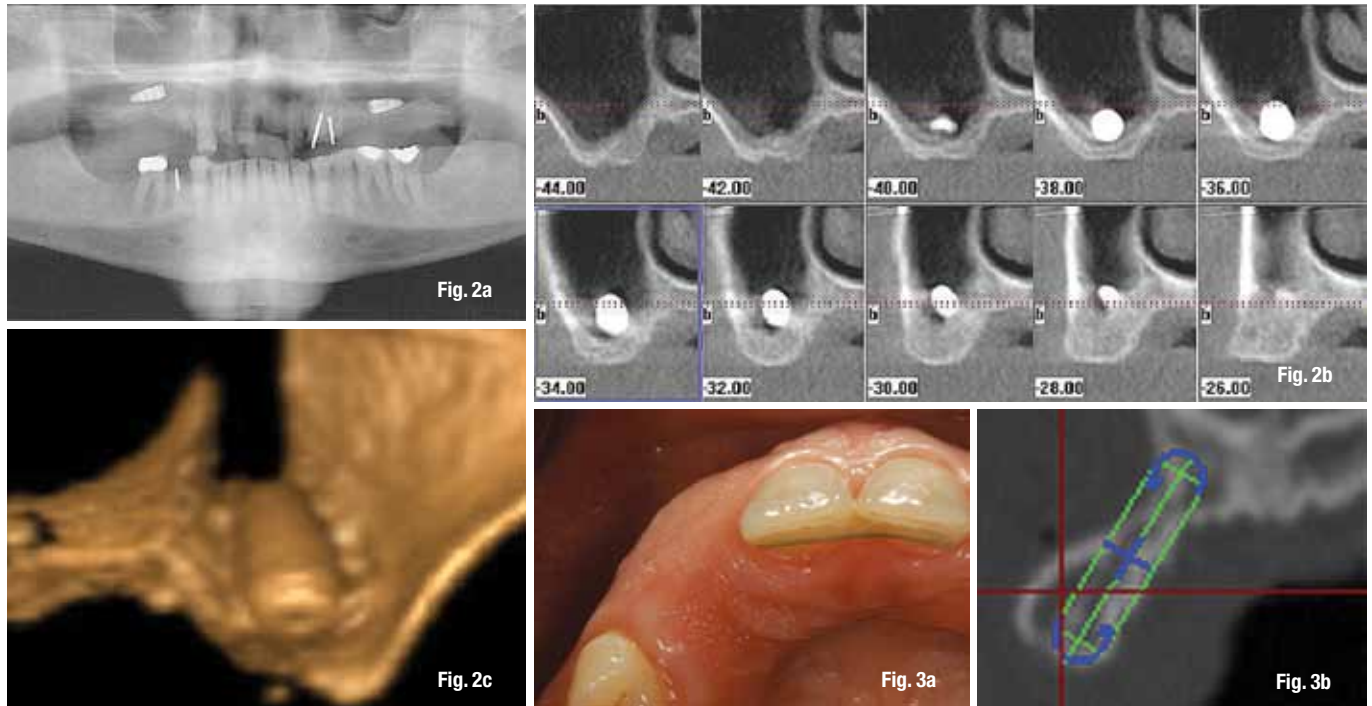
Essentially, CBCT dental imaging was a paradigm shift, especially for oral implantology where measurements are precise and provide practitioners clear insight into a patient's anatomical relationships. CBCT-based dental imaging uses advanced technology to provide the most complete anatomical information on a patient's oral and maxillofacial region, including the mouth, face, jaws, TMJ and other areas, leading to

Fig. 1a_A postoperative periapical radiograph revealing the dental implant perforating the maxillary left sinus. (Photos/Provided by Dov M. Almog)

Fig. 1b_A postoperative cross-sectional slice utilizing the i-CAT™ three-dimensional CBCT (Imaging Sciences International, Hatfield, Pa.) reveals the dental implant perforating the maxillary left sinus from a different perspective.

Fig. 1c_A postoperative three-dimensional virtual rendering (3DVR) utilizing the i-CAT CBCT provides a visual demonstration of the extent to which the dental implant penetrated into the maxillary left sinus.





enhanced treatment planning and predictable treatment outcomes.

As far as other physical mechanisms contributing to implant failure modes, for the most part, the research and review papers concluded that the crown-to-root ratio guidelines associated with natural teeth should not be applied to a crown-to-implant restorations ratio. According to these papers, the crown-to-implant ratios of those implants that were considered successful at the time the reviews took place were similar to those implants that failed. Apparently, according to some of these papers, the guidelines that are used by some clinicians to determine the future prognosis of implant-supported restorations lack scientific validation as far as the possible grounds for implant fractures.

Furthermore, while the overall success rate of dental implants is high, accomplishing predictable reconstruction and esthetic results for single or multiple teeth replacements with dental implants is challenging. As dental implants become an increasingly viable treatment for replacing missing teeth, we may encounter more random maxillofacial anatomic and occlusal conditions.

The consequences

As far as oral implantology, like several institutions and authors have forecasted,^{1,2} with the rapidly aging population trend in the developed world and the resulting enormous unmet need for replacement of teeth, the growth in implant-based dental reconstruction products and services outstripped

all other areas in dentistry. What's more, in recent years implant dentistry and implant-based dental reconstructions have become part of the curriculum in the undergraduate and graduate programs of dental schools.³

Yet, a large number of dental practitioners, including generalists and specialists, with different levels of proficiency who saw the opportunity to move into these sophisticated oral implantology arenas, continue to overlook the advantages of CBCT, and as a result we are observing a diversity of abnormal complications associated with these surgical procedures.

Dental practitioners can obtain only vague dimensions from traditional two-dimensional intraoral and extra-oral radiographic images due to magnification variations as a result of positioning and projection of anatomical structures, their properties and relationships. It is very difficult for traditional radiographs, such as periapical and panoramic images, to precisely replicate the anatomical structures captured on their receptors.

Traditional two-dimensional radiographic images essentially exhibit magnification, distortion, overlap of anatomical structures, restricted clarity and lack of accuracy in measurements, and therefore, the dimensions or determination of precise anatomical structures' relationships are inaccurate. In addition to that, two-dimensional radiographic images do not allow for three-dimensional virtual rendering (3DVR).

A literature and Internet search revealed several published research and review papers on implant failures.⁴⁻¹² One common failure associated with dental practitioners restricting their diagnostic field to two-

Fig. 2a_ A postoperative panoramic radiograph revealing two dental implants displaced in the right and left maxillary sinuses.

Fig. 2b_ Postoperative cross-sectional slices through one of the displaced implants in the right maxillary sinus utilizing the i-CAT CBCT that reveals the dental implant and its anatomic orientation in the buccal lingual perspective.

Fig. 2c_ A postoperative 3DVR of the displaced implant provides the surgeon feedback as to the surgical approach. In this case, a Caldwell-Luc procedure was performed using a bur to create an access window through the lateral wall of the maxilla, thereby gaining direct access to the displaced implant.

Fig. 3a_ What dental practitioners see clinically does not always reflect the correct alveolar bone anatomy underneath the surface.

Fig. 3b_ Pre-operative diagnostic dental image utilizing the i-CAT CBCT. The CBCT-based cross-sectional slice in the edentulous area of teeth #6 and 7 revealed in advance a natural buccal concavity in the alveolar bone, requiring bone grafting prior to or during the implant procedure.