

# *A Decade of* Cone Beam Computed Tomography

SOTIRIOS TETRADIS, DDS, PHD, AND STUART C. WHITE, DDS, PHD

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## GUEST EDITORS

**Sotirios Tetradis, DDS, PHD**, is a professor and chair in the Section of Oral and Maxillofacial Radiology at the University of California, Los Angeles, School of Dentistry.

**Stuart White, DDS, PHD**, is professor emeritus in the Section of Oral and Maxillofacial Radiology at University of California, Los Angeles, School of Dentistry.

Cone beam computed tomography was introduced in oral and maxillofacial imaging a decade ago. It was recognized immediately that CBCT provided a paradigm shift in imaging the craniofacial complex. Utilizing a relatively low ionizing radiation, CBCT offers the 3-D representation of hard tissues with limited information on soft-tissue detail.

CBCT exhibits clear advantages over conventional radiographic methods, including controlled magnification, lack of superimposition, absence of geometric distortion, and convenient multiplanar and 3-D displays. These advances offer improved structure visualization and diagnostic efficacy. Continuous software and hardware improvements allow ease and speed in data acquisition, reconstruction, and display. Several commercially available cone beam scanners and third-party software providers provide the dental practitioner a variety of options that can be tailored to their specific needs and applications. Indeed, CBCT finds applications in almost every aspect of dentistry from restorative to periodontal to endodontic to orofacial pain to orthodontic and surgical patients.

An important distinction between CBCT and conventional imaging is the extent of the imaged volume. Normal

and pathologic radiographic findings in the teeth and jaws seen on periapical, bitewing, or panoramic radiographs are familiar to all dentists. However, with CBCT, the imaged volume often includes the brain, base of skull, nasos- and oropharynx, neck, and cervical spine. Many dentists are unaccustomed to the radiographic normal and pathologic appearance of such structures and may be overwhelmed by the various reconstruction possibilities offered by CBCT technology for imaging these areas. The responsibility of the dentist regarding interpretation of structures outside the orofacial complex and the rights of the patient for correct diagnosis of anomalies affecting these structures have not been clearly delineated.

Although becoming more prevalent and available to dental professionals,

CBCT is far from replacing traditional imaging technologies. Factors limiting its usage include cost for the equipment and imaging studies, higher radiation dose compared to conventional radiographs, relative sophistication of operation, prolonged time required for image manipulation and interpretation, and compromise of image quality around metallic or other dense material. Furthermore, despite enhanced visualization of the orofacial structures, published evidence supporting CBCT's contribution to improved treatment planning and management, as well as treatment outcomes is not

always available. Comprehensive selection criteria for utilization of CBCT technology for several dental applications have not been established.

The articles in this volume of the *Journal of the California Dental Association* describe the most common applications of CBCT in dentistry and critically review published studies on CBCT contribution to dental treatment planning and outcomes when available. In the absence of such studies, and recognizing that an expert's opinion is the minimal level of scientific evidence, the authors provide their personal recommendations. Finally, ethical and

legal ramifications regarding dentist and patient responsibilities and rights regarding pathologic findings outside the area of interest will be discussed.

Although CBCT technology was originally introduced as state-of-the-art imaging, it is entering the mainstream of everyday dentistry, enriching the diagnostic armamentarium of dental practitioners. It is the intent of the editors and the authors that these reviews will not only present an overview of CBCT utilization in dentistry but, will furthermore, provide a reference source for optimally employing this technology in the management of our patients. ■■■■