

# Cone Beam Volume Tomography: A New Digital Imaging Option for Dentistry

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Dentistry continues to “go digital.” Use of digital radiography has increased in private practice, particularly



with endodontists. Computed Tomography (CT) is routinely performed for dental implant imaging, and many dental schools are moving toward a paperless and filmless environment. As this trend continues, a question is “What are we trying to achieve?” Is it just a fast way to get an image? A method to reduce patient record storage? Save the environment from processing chemicals? Reduce

remakes by digitally adjusting contrast and brightness?

Or, is there a greater possibility?

## The future is not on the distant horizon but rather is developing in the present.

My view is that the greater imaging goal for dentistry is development of the 3-D patient model. An anatomically accurate "virtual patient" upon which diagnosis, simulation and treatment planning could occur. Use of medical digital imaging has progressively increased in dentistry. CT, MRI and ultrasound are examples. In fact, the application of these and other technologies to dentistry and the future direction for oral and maxillofacial imaging was the subject of the 2002 Inaugural Conference of the Coast Conference on Orthodontic Advances in Science and Technology, held in Pacific Grove, Calif.

The direction at this conference can be found in a brief description of the topics presented and the program titled "Craniofacial Imaging in the 21st Century, New Approaches, Challenges and Applications." Approximately 150 clinicians, educators, and researchers from around the world attended to discuss the future impact of imaging technology upon the practice of dentistry. Three topic categories existed: visualization, with focus upon patient modeling; simulation, the reproduction of biomechanical events to aid diagnosis and treatment planning; and therapeutics, the role of computer-assisted treatment and appliance design. 3-D volume imaging in a dental environment is key to developing the patient model.

### Introduction to New Technology

Cone beam volume tomography (CBVT) is a method to produce volume imaging quicker and easier than conventional CT. The technology has been used to design CBVT systems

specifically for dental imaging. These dental systems were developed in Europe and Asia. While more than 100 systems are in use worldwide, the first system wasn't commercially available in the U.S. until 2000. Once available, the technology has expanded rapidly across the country, especially in California. There are now approximately 30 of these machines in the U.S., the majority of which are centered in California. Currently, all of the dental schools in California have either direct or indirect access to this technology and students are being trained to appreciate the benefits and application of 3-D multiplane imaging for a wide variety of dental applications. The impact is such that three other CBVT systems have been developed and are either commercially available or will be soon.

The development and application of such concepts show that the future is not on the distant horizon but rather is developing in the present. Therefore, the purpose of this *Journal* issue is to familiarize the readers with the current application of CBVT 3-D volume imaging in dentistry.

The first article by Drs. Danforth, Dus, and Mah presents the four different CBVT systems developed for 3-D oral and maxillofacial imaging. It describes the basic differences between the utilized 3-D cone beam technology and medical CT, plus provides a table of comparative features for the systems. The remaining articles focus upon the clinical application of this imaging. Drs. Mah, Enciso, and Jorgenson describe how 3-D imaging

is used for evaluation of palatal root resorption of maxillary lateral incisors when the neighboring canines are slow to erupt. Dr. Hatcher, Mr. Dial, and Ms. Mayorga show the application of this low patient dose technology for dental implant imaging and other imaging examinations. Drs. Erickson, Caruso, and Leggitt describe a case in which CBVT imaging helped to solve an unusual problem of lip paresthesia that developed following orthodontic movement of a mandibular molar. Lastly, Drs. Danforth, Hall, and Mr. Peck show how CBVT imaging can assist both the surgeon and patient during surgical treatment planning, risk assessment, and treatment outcomes of impacted mandibular third molars.

The contributors to this *Journal* are enthusiastic users of CBVT technology and are excited about not only the current applications of the technology, but also for the applications to come. We appreciate the opportunity to share our experiences and vision of the future. The concepts associated with the Coast Conference on Craniofacial Imaging are a reality. We hope that our participation in this *Journal* will be helpful to the readers as you become more aware and involved with the reality of 3-D volume imaging and computer patient modeling for dentistry. **CDA**



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