Dr. David Gane interviews Dr. Allan G. Farman about 3-D CBCT systems

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The adoption rate of 3-D CBCT systems in dentistry is amazing. With an increasing number of units in service, CBCT promises to revolutionize patient care and impact treatment outcomes. Although CBCT has generated much excitement, its use has also prompted questions about dosage, professional responsibility, reimbursement, education, and utilization. To better understand these issues, I recently talked with Dr. Allan G. Farman in Atlanta.


Dr. Allan Farman

DR. DAVID GANE: To what do you attribute the impressive growth of CBCT technologies in dentistry? In your estimation, will CBCT ever completely replace 2-D dental radiography?

DR. ALLAN G. FARMAN: CBCT is not a new development; its prototype originated in the late 1970s. However, the enabling technologies of CBCT — fast and inexpensive computers, high quality digital sensors capable of rapid image acquisition, robust X-ray generators, and image reconstruction algorithms — had not reached sufficient maturity to permit the production of affordable dental CBCT systems until recently. Think about the cellular phones of 1988-'90, and then think of today's iPhone and you will better understand the impact of complementary technological evolution in dental diagnostic imaging.

The question, "Will CBCT imaging ever completely replace 2-D dental radiography?" is an interesting one. In my estimation, the two are complementary. I always review 3-D volumes in orthogonal 2-D slices and slabs to assist diagnosis, but now I can provide these 2-D slices in all planes without re-exposing the patient. There are situations where CBCT is not ideal, particularly in dental caries detection. Beam hardening artifacts and streaking due to metallic restorations can give the illusion of caries in a tooth that is actually sound.

Presently, CBCT should never be relied upon for dental caries diagnosis. After having read thousands of CBCT volumes, it is my professional judgment that CBCT is useful in planning most, if not all, dental implant placements in the evaluation of impacted teeth (especially mandibular third molars superimposed in 2-D on the mandibular canal), and for certain endodontic evaluations. Practitioners working on such cases should consider purchasing a CBCT system or referring patients out for CBCT imaging.

GANE: Currently there are a large variety of CBCT systems to choose from. Do you see any trends emerging with respect to which types will best serve the needs of the profession and the patients they serve?

FARMAN: Maxillofacial CBCT now has two distinct categories. Smaller field-of-view, high-resolution systems are especially useful for local examinations such as endodontic assessments and examining dental impactions. These CBCT systems are often combined with space-saving panoramic and/or cephalometric modalities. Then there are larger field-of-view systems (which generally have lower spatial resolution) for surgical and orthognathic assessments.

GANE: Recently the media cited studies suggesting that increased use of multislice medical CT could lead to negative health repercussions. How does CBCT patient dose compare to medical CT and traditional 2-D modalities such as the panoramic and the intraoral full-mouth survey?

FARMAN: Ionizing radiation should be prescribed based on professional judgment of diagnostic necessity, and this has always been the case. Particularly in young children and adolescents, care must be taken to minimize radiation dose to As Low As Reasonably Achievable – ALARA – as young age groups are often more susceptible than adults to the ill effects of ionizing radiation. Today, most CBCT systems are comparatively low in dose compared to multislice CT.

Still, one should be careful to expose only the regions that need to be studied. It is preferable to purchase a unit that has the ability to collimate the field-of-view to decrease patient dose. Small field of view CBCT can be very similar in dose to traditional intraoral and panoramic imaging, especially where assessing dental anatomy can be assisted by the use of multiple periapical views, as in endodontics.

GANE: No guidelines or clinical selection protocols have yet emerged for CBCT utilization. Are such guidelines in the works, and if so, who is working to establish them?

FARMAN: There have been initial proposals for guidelines from the oral and maxillofacial radiology and orthodontics professions in Europe; however, these are preliminary at best. The American Academy of Oral and Maxillofacial Radiology is currently working on several position papers that will include guidelines for use of CBCT. These are for endodontics, orthodontics, TMJ imaging, and implant planning.

Overall coordination of the effort is being led by Dr. Mansur Ahmad, AAOMR position paper editor. Plans are to have position papers available starting in the fall of 2010.

GANE: Reimbursement often drives the adoption of technology. What's your opinion on CBCT third-party reimbursement. Do you think that CBCT will ever reach panoramic radiograph status with respect to reimbursement?

FARMAN: I am told that CBCT scans relating to implants are covered for some individuals who have premium dental insurance policies; however, this is — like most health-care insurance in the U.S. — far from universal. This is not due to the CBCT procedure per se, but rather because dental implantology is often seen as elective and is therefore not covered by insurance.

Other diagnostic uses of CBCT, such as TMJ studies and extraction of mandibular third molars, are more likely to be covered. There are CDP codes for CBCT; however, the mere existence of such codes is no guarantee that insurance coverage will be achieved.

GANE: You have reviewed and reported on thousands of CBCT volumes to clinicians. What are the most common findings you see in CBCT volumes, and what is the professional responsibility of a clinician obtaining a CBCT volume?

FARMAN: The types of findings made will depend on the patient base. My colleague, Dr. William Scarfe, and I have a patient population slanted toward older adults. In this population we're finding carotid artery calcifications with stenosis — proven by subsequent ultrasound studies of blood flow — in approximately one in 10 scans. This condition can predispose the patient to stroke and correlates with cardiovascular disease. Tonsilloliths are also found in approximately one in 10 of our patients. These are usually harmless.

Other incidental findings of no consequence are calcification of the pineal gland and/or choroid plexus in the cranium, and triticeous cartilages or thyroid cartilage in the neck that can be mistaken by the untrained eye for carotid calcifications. Paranasal sinus and nasal passage diseases are also very common. Neoplastic and cystic processes have been detected on occasion, and these are often outside the prescribed region of interest. Spinal injuries, arthritic changes, and other pathologies may also be detected.

GANE: How can a practitioner receive a second opinion written radiology report? How much is the service and how does it work?

FARMAN: There are a number of commercial services (e.g., Orbit Imaging, Dimensions Imaging, 3-D Diagnostix, 360°, and more) who retain the services of oral and maxillofacial radiologists to read image volumes for unsuspected pathologies within the entire image volume. Depending on the scope of the service provided, costs average between $60 and $120.

GANE: I have heard you say that CBCT moves imaging from pure diagnosis into the realm of guided treatment. Can you explain what you mean by that?

FARMAN: CBCT datasets can be used to make virtual or physical models, to simulate treatment, and to predict treatment outcomes. CBCT datasets can also be used to develop individualized surgical guides for implant placement. The health-care professions are quickly moving toward individualized services rather than "one treatment fits all," based on mere population averages. CBCT is certainly a major enabling technology in this respect.

GANE: There seems to be a strong need for CBCT education. Are there any educational requirements for doctors wishing to purchase and use CBCT technology?

FARMAN: Some European countries require completion of at least a basic standardized course in CBCT before a dentist can operate a CBCT system. The American Academy of Oral and Maxillofacial Radiology intends to develop similar basic CBCT credentialing courses for the U.S.

The goal is to provide information about CBCT image selection, field-of-view choice, resolution selection, radiation safety and protection, and an introduction to CBCT anatomy. The AAOMR Continuing Education Committee, under the leadership of Dr. Maria Mora, is charged with initiating these courses, which will be rolled out soon. DE

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