Clinical and diagnostic advantages of PreXion 3-D imaging system

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By Dan McEowen, DDS

F or 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 occasion-
These radiographs can often superimpose nerves and sinusues 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 panorax of the superimposed third molars gave no solid evidence that 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). Other surgical advantages include the fact that one can see the position of supernumerary or impacted teeth. The panoramic images (Fig. 10) show the position of the supernumerary canal and radiolucency. For the periodontist, the use of CBCT and the MPRs can aid in the accurate morphologic distinction of impacted 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, 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. 15).

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 panoramic images. 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.3,5

**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 submentovertebral (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 airflow analysis, all with both soft-tissue and skeletal information.5,7

**Conclusion**

We treat our patients in 3-D, and now, with conebeam 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.

**About the author**

Dan McEown, DDS, 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 Clini-cal Laser Institute, achieving a mastership level of proficiency. He has been active in FDA approval of oral surgery techniques using Erbium lasers. McEown 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. McEown has been involved in cone-beam technology for more than five years and owns 3D Imaging Center in Maryland.

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