My cone-beam system has even revealed supernumeraries, cysts and foreign objects hidden within standard radiographs.

When evaluating for implants, 3-D imaging allows the clinician to determine the height and width, as well as the quality, of the bone in the implant area. Moreover, 3-D provides the ability to precisely evaluate the distance and angulation between roots of adjacent teeth to avoid damaging said teeth during implant placement.

Because implants are generally the preferred restoration for the missing single tooth, an orthodontist can scan a patient prior to debanding to determine exactly how the teeth are aligned within the bone and make any necessary corrections. It would be very disappointing for a patient to anticipate receiving an implant and crown only to realize later that the orthodontist didn’t create enough space for the implant.

Three-dimensional imaging provides for more precise measurements than 2-D panoramic radiographs, which can be unreliable because of distortion and superimposition. Cone beam offers true 1:1 anatomical measurements, eliminating geometric errors of projection and supporting accurate linear measurements.

All of this improves surgical predictability for orthognathic surgery cases. With 3-D, I don’t have to calculate for magnification errors when determining the amount of surgical correction on these cases.

Prior to 3-D imaging, my orthodontic diagnostic records always included panoramic X-ray and lateral and frontal cephalograms. Now, with one scan, I gain the panoramic, lateral and frontal images, as well as everything in between. Skeletal asymmetries that may not be clearly visible on 2-D head films are more evident with a cone-beam scan. 3-D makes it easier to determine the buccal, lingual and vertical position of impacted teeth.

Cone-beam imaging also helps with informed consent. 3-D scans reveal pathologies that may have become lost in 2-D images because of distortion, magnification and the superimposition of anatomical structures. I discovered a horizontal root fracture on a patient and subsequently referred him to an endodontist for evaluation. This patient needed to be aware of the likelihood that the tooth could be lost because of previous trauma. Without this insight, foreshortening of the root, or even tooth loss, may have been blamed on the orthodontic treatment.

For TMJ disorders, with one scan that takes just a couple of minutes, I get panoramic, frontal and lateral views as well as corrected tomographs that would have taken me an hour or more with 2-D methods.

After implementing cone beam, I discovered some interesting cases. In one case, we were waiting patiently for the second permanent tooth to emerge, and with the cone-beam scan, we were able to determine that an impacted tooth was present. This allowed us to plan the orthodontic treatment accordingly.

Fig. 2: Scan saves the patient unnecessary surgery.
Fig. 3: Precise position of an impacted central incisor.
Fig. 4: Patient educated on pathology.
molars to erupt prior to initiating phase II treatment. After the other three second molars had already erupted, as part of progress records, the i-CAT® scan showed that an impacted third molar was impeding the eruption of the maxillary right second molar (Fig. 1).

On previous “standard” pans, the fourth third molar was perfectly superimposed with the second molar, and was not evident. This second molar may never have erupted, or worse yet, may have been presumed to be “ankylosed.”

In another example, a patient was referred from an oral surgeon for an i-CAT scan. The referring oral surgeon wanted to clarify diagnoses made at another office, based upon previous digital pans, including a supernumerary, odontoma, failure to erupt and/or ankylosed deciduous second molar.

On the scan (Fig. 2), it was evident that it was just an ankylosed deciduous second molar. Our cone beam also gave us a great view of another patient’s horizontally impacted maxillary central incisor (Fig. 3). When treatment started, the i-CAT machine aided the oral surgeon in exposing and placing a gold chain on the central incisor for guided eruption. Her impacted canine, detected on the previous scan, has also since been brought into place.

Regarding patient education, an oral surgeon referred a patient for an i-CAT scan to verify the position of the mandibular canal in relationship to the impacted third and dentigerous cyst prior to extraction (Fig. 4). This helped the patient visualize the extent of the third molar impaction and appreciate the size of the cyst. The patient was so impressed with the i-CAT scan that he consequently set his daughter up for orthodontic treatment.

One of my most unusual cases involved a young patient who came in for braces, but after the i-CAT scan left with some clues that led to an ENT solving the mystery of her hearing loss (Fig. 5).

While some of these cases show hidden pathologies, it is no secret that 3-D imaging sheds light on our more difficult cases and, no matter what our specialty is, adds a new dimension to our practices.

Dr. Bradford Edgren earned a doctorate of dental surgery from University of Iowa, College of Dentistry and a master of science in orthodontics. He is certified by the American Board of Orthodontics, is a diplomate of the American Board of Orthodontics and is a member of the College of Diplomates of the American Board of Orthodontics. He is also a member of the American Association of Orthodontists, Rocky Mountain Society of Orthodontists, Colorado Orthodontic Association, Edward H. Angle Society of Orthodontists — Southwest Component, American Dental Association, Colorado Dental Association and Weld County Dental Association.

To register for and view Dr. Edgren’s complete Webinar on 3-D imaging, including a discussion of these cases and others, check out the online archives section of the brand new Ortho Tribune Study Club at www.OTStudyClub.com.