EDITORIAL

Cone-beam computed tomography: Have we identified the orthodontic benefits?

As you will no doubt notice, this issue of the AJO-DO includes our annual Product Guide, which highlights many materials that we use daily in our private practices. As in the past, we have given this issue a special theme. All Original, Online, and Techno Bytes articles in this issue are on the topic of three-dimensional (3D) imaging. We are presenting articles that not only discuss cone-beam computed tomography (CBCT) technology and its application in orthodontics, but also illustrate the use of 3D stereophotogrammetry. We are certainly entering a different era in radiographic and photographic documentation.

The 3D images that we see presented at orthodontic meetings are impressive in their detail. And their ability to show spatial relationships in 3 dimension helps us to diagnose the relative location of the anatomic parts of the craniofacial complex. So it would seem that the orthodontic community should openly welcome these new imaging techniques as a step forward in the treatment of our patients. But is that true? Have we really identified the orthodontic benefits of 3D imaging? One obvious benefit would be to assist orthodontists in managing patients with unusual eruption patterns such as ectopic eruptions, impactions, and tooth transpositions. After all, the diagnosis and treatment of these problems would definitely be improved with 3D imaging. But if you believe that statement, then I want you to carefully review the 3 case reports in this issue of the AJO-DO. One documents the treatment of a patient with tooth transposition. Another illustrates the surgical and orthodontic management of a horizontally impacted mandibular canine. The third chronicles the orthodontic eruption of multiple impacted teeth. But here is the interesting common thread among these 3 case reports: none used any form of 3D imaging in the treatment of the patient. And all 3 were treated to an excellent result.

Would 3D imaging have improved the outcome of treatment? I doubt it. Would a 3D understanding of the spatial relationships of the teeth have made the diagnosis easier? Perhaps. Would the diagnostic images produced by CBCT technology have cost the patient more money? Undoubtedly. So, in these 3 cases, what is the benefit compared with the risk? What risk could there be from a CBCT scan? How about increased radiation? It is estimated that 1 diagnostic scan exposes a patient to 3 to 7 times the radiation of a panoramic radiograph.

Proponents of 3D imaging would argue that much more information could be gained from 1 scan. For example, one could slice the scan in a way that would produce a panoramic image that could accurately illustrate interproximal bone levels. But would these bone-level relationships be more accurate than vertical bitewings or anterior periapical radiographs? Some suggest that a CBCT scan could accurately predict the bone thickness on the labial aspect of teeth. Really? If you believe that claim, you will be interested in reading the Techno Bytes article that discusses this specific application of CBCT. Then there are the proponents who suggest that CBCT can accurately document the increase in the airway after rapid palatal expansion. Interestingly, an Original Article in this issue refutes that claim. But 3D imaging should help our understanding of the treatment and posttreatment changes with orthognathic surgery. After all, jaw surgery truly produces 3D alterations in the craniofacial complex. Yes, that is true, and these changes are well documented in an excellent research project in this issue. But what was required to gain this information? CBCT scans were made for each of 27 patients immediately before jaw surgery, 4 to 6 weeks after surgery, and then 1 year postoperatively. Three CBCT scans in 1 year. Is this overuse or appropriate use of radiation? I am not certain of the answer to that question.

The pendulum of imaging technology is quickly swinging toward 3D CBCT. But as clinicians in private practice who order these scans for our patients, we must first ask this question: will the benefit that I gain from this scan outweigh the potential risk to the patient? The responsibility is ours.

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