COMMENTARY

Presurgical Planning in Implant Restorations: Correct Interpretation of Cone-Beam Computed Tomography for Improved Imaging¹

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The need for "3D dental imaging" in managing some patients in any dental practice today is without question an absolute given with the current standard of care, even if that practice is not involved with implant dentistry! Should a practice be involved with implant dentistry,² this article should be "required reading" by both restorative and surgical providers.¹

For those of us who started placing implants in the early 1980s, we quickly realized that two-dimensional imaging in implant surgery was often like doing surgery with your dominant hand tied firmly behind your back. Then, along came in-office tomographic imaging such as the Implatome, at that time distributed by Sterioss (Yorba Linda, CA, USA) (presently Nobel Biocare, located in Yorba Linda), which was outstanding when you obtained a good image, but it was about as user-friendly as a nest of rattlesnakes! But give them credit, as they helped open the appetite of surgeons everywhere for "3D" imaging. Then, we were sort of rescued in the early 1990s by Columbia Scientific, Inc. (Columbia, MD, USA) (presently Materialise, Plymouth, MI, USA) with SIMPLANT which used medical computed tomography scanners for image acquisition. It was great, but again, only when you could get the radiology technician to correctly position the patient ... far better than the "rattlesnakes," but sometimes, it was still like pushing the "rope up the hill."

These humorous comments are made not to be critical or disparaging of these companies or technologies as their efforts and evolution absolutely evolved implant surgeons who developed not only great surgical skills, but exceptional diagnostic and planning capabilities. Along the way, most of those "great surgeons" (especially myself) also had stomach lining disorders due to repeated patient positioning issues! They learned that their images were not always what they desired as the software that was available could not correct the scans, or as the authors describe, "reconstruct" the images to obtain precise tomographic (cross-sectional) images.

Although this article is clearly a double case presentation, it absolutely demonstrates the importance of correct usage of cone-beam computed tomography (CBCT) as it relates to implant planning and placement, driven by a desired prosthetic outcome hopefully driven by a complete treatment planning process.³ The beauty of most modern CBCT imaging and software is the ability of the surgeon, restorative doctor, or in some cases, the oral and maxillofacial radiologist to adjust the image in order to obtain a correct and desired cross-sectional image.

As the authors state, this is typically an image that should be aligned with the long axis of the tooth and usually perpendicular to the "peak" or crest of the ridge. It should not, as they correctly describe, be perpendicular to the inferior border of the mandible. However, in an individual with a very square angle of the mandible, the inferior border could in fact be close to paralleling the occlusal plane which is usually what is used as a reference for the perpendicular cross-sectional image. It should be recognized though that some restorative/implant treatment options require implants to be placed at significant angles so the implant surgeons may desire "slices" other than perpendicular to the occlusal plane or not with the "long axis" of the tooth.

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This commentary is accompanied by article, "Presurgical Planning in Implant Restorations: Correct Interpretation of Cone-Beam Computed Tomography for Improved Imaging" S. Kourtis, DDS, Dr.Dent., E. Skondra, DDS, I. Roussou, DDS, MSc, Dr.Dent., E.V. Skondras, DDS, DOI 10.1111/j.1708-8240.2012.00505.x.

Placement of implants in this non-perpendicular manner would be similar to following an inclination similar to Figure 18 in the article. The authors describe that slice as "distorted." Certainly, in pre-CBCT imaging, such as with panoramic imaging, we would see true distortion⁴ when comparing an actual specimen with an image of that specimen. Although the authors do correctly demonstrate the need for proper orientation and "reconstruction" prior to implant planning, we should be aware that contemporary CBCT software does allow us to make angled or oblique type images that dimensionally are correct.

Finally, the authors are to be commended for three other simple but highly significant stated and non-stated outcomes of their work. First and most importantly, they point out the importance of reorientation of the image as opposed to radiating the patient another time to correct an alignment issue. The second is the importance of understanding not only the role of the radiographic template in imaging but of the restorative doctor appreciating the three-dimensional challenges that exist beyond the template. Simply creating a restorative template (surgical guide) in no way suggests there is an adequate quantity of bone under it or that the bone has been properly evaluated. And lastly, the authors demonstrate the importance of the team for safe and effective patient outcomes. No matter how well trained the implant doctor may be, the correct use of CBCT by all members, which today may include the dental laboratory as well, is extremely critical and continues to be refined by oral and maxillofacial radiologists as well as surgical and restorative researchers.

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