

How Well Are We Diagnosing Our Orthodontic Patients?

Successful interdisciplinary outcomes are dependent upon an accurate diagnosis, prognosis, and treatment plan. In this context, the role of the orthodontist is indispensable. Over the last 20 years, CBCT has indisputably been a transformational diagnostic modality influencing the profession. Historically, its use has been limited in scope and purpose rather than as a dynamic platform. In today's standard of care, CBCT and interactive software simulation programs are becoming more common. Their utilization has improved diagnostic abilities and expanded treatment planning opportunities, allowing more comprehensive problem solving.¹

The orthodontist holds the most unique and influential position of any dental provider: to direct (or redirect) predisposed craniofacial, dental, and airway destinations of patients. They are the earliest caretakers of dentoalveolar bone and mucogingival health and carry a heavy responsibility for influencing long-term vulnerability. The diagnostic role of the orthodontic specialist has gone beyond solving inter- and intra-arch dental alignment problems. Today, their diagnostic roles have expanded to include: assessment of the upper respiratory tree and pharyngeal space dimen-

sions and their impact on medical conditions; identification of physical abnormalities, maxillofacial pathology, and temporomandibular joint conditions; and screening/evaluation of craniofacial abnormalities as well as orthognathic deformities.² These healthcare privileges and duties cannot be gained from do-it-yourself tooth movement plans nor expected from business models whose focus is on straightening the crowns of crooked teeth.

Tooth movement must occur and finish with the tooth roots firmly anchored within the alveolar bone boundaries to ensure long-term health and stability.³ With this in mind, we need to ask the question: Are we using the most helpful imaging modalities to guide treatment and provide risk assessment in today's environment? CBCT and orthodontic simulation (which identifies changes in the dentoalveolar complex influenced by tooth movement) are critical in providing transparency to the patient and interdisciplinary team.⁴ Such transparency can help the team better assess goals and outcomes that consider and respect foundational dentoalveolar parameters while contributing to sustainable outcomes (Figs 1 and 2). These 3D treatment-planning modalities also aid in understanding how skel-

etal movements will impact airway dimensions and the face. When managing malocclusion, clinicians must decide who undergoes CBCT scans and when. While other digital simulation technologies have value in less demanding cases (such as ClinCheck by Invisalign), there are inherent diagnostic limitations when only half of the anatomy is given for planning. The opportunity to appreciate the dental alignment and occlusal resolution without the understanding of how such movements would impact the periodontal foundation should perhaps be limited to cases involving "minor" tooth movement. On the other hand, it could be argued that localized anatomical analysis may be of even greater value. The use of CBCT-based risk assessment through pre-operative virtual "dress rehearsals" using computer simulations of tooth and skeletal movements represents a quantum leap forward in treatment planning for the entire interdisciplinary team. As such, using CBCT imaging for diagnosis alone and then reverting to "mental navigation" for the technical aspects of tooth movement may represent a missed opportunity when compared to using available technology, such as robotically bent, shaped memory alloy arch wires that are developed

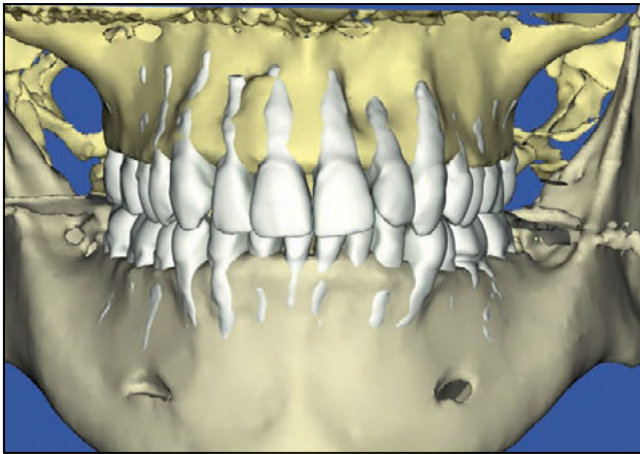


Fig 1 3D modeling from the CBCT DICOM (Digital Imaging and Communications in Medicine) file joined with interactive treatment-planning software. Note the dentoalveolar deficiencies documented in the 3D rendering, which are difficult to appreciate with traditional orthodontic imaging modalities.

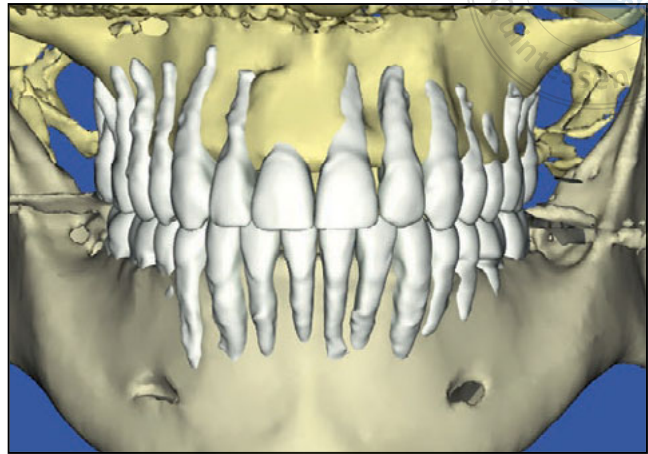


Fig 2 3D CBCT DICOM data modeling and interactive software showing a set-up for an "orthodontic only" compensation correction of the occlusion. Note the change to the periodontal foundation that would occur with the proposed treatment plan. CBCT technology offers the knowledge to avoid this misstep and prevent irreversible periodontal sequela. Understandably, a broader maxillofacial diagnosis should be considered prior to initiating treatment.

from the treatment plan of a predetermined, 3D CBCT-based set-up.

Additionally, the use of 3D CBCT and interactive treatment-planning software allows the patient to be educated and informed in ways that previously were not possible. This technology can open new treatment possibilities for our patients and our profession. The key is recognizing how to balance the benefits of digital CBCT diagnostics, the limitations of the technology and computer software, and the reality of executing a virtual plan for patient care in a live setting. Indeed, there are times when an analog mo-

dality will be preferred, but decision-making can often benefit from the superior diagnostic information that CBCT imaging affords.

The era of personalized digital dental medicine is here. Comprehensive interdisciplinary diagnosis starts with a maxillofacial perspective and seeks to achieve a stable occlusion while optimizing the periodontal phenotypical outcomes and centering the teeth in alveolar bone.⁵⁻⁹ Orthodontic treatment planning is more balanced and transparent when guided by a biologic compass and a periodontal conscience. CBCT imaging and in-

teractive computer software planning systems are not limited to enhancing the scope of diagnosis. This technology is establishing new professional standards and collaborative opportunities to improve our interdisciplinary outcomes. The question that each of us needs to answer is: At what level will we continue to practice?

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