Chapter 12
Airway Changes Detected by Cone Beam Computed Tomography (CBCT) in Muscular Temporomandibular Joint Dysfunction Subjects Treated With Disclusion Time Reduction (DTR)

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ABSTRACT

The application of Cone Beam Computed Tomography (CBCT) in the field of dentistry has revolutionized the outlook of dental practitioners when diagnosing, treatment planning, and measuring treatment outcomes, because CBCT has wide-ranging applications in both oral surgery and in forensic odontology. Traditionally, airway volumetric assessments and boundary determinations were performed with 2-dimensional lateral cephalometric radiographs. However, the advent of CBCT makes it possible to precisely measure the Airway dimensions and volume, the presence of any constrictions, the position of the hyoid bone, and the position of the tongue relative to the palate. Disclusion Time Reduction (DTR) therapy is a novel, splint-less, measured occlusal calibration technique primarily aimed at decreasing nociceptive impulses arising from excess compressions of the pulpal and periodontal ligament mechanoreceptors of the teeth, which produce masticatory muscle, pharyngeal muscle, and glossal muscle hyperactivity. DTR therapy is carried out using the T-Scan 10/BioEMG III interface to measure the obtained reductions in muscular hyperactivity. However, the applications of DTR appear to extend beyond its' well known TMD therapeutic benefits, to also impact the airway, and the pharyngeal and tongue musculature. This chapter's Specific Aims are to discuss the role of CBCT in the evaluation of airway and its' related structures, along with describing how DTR therapy can dynamically and physiologically

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change the airway volume without requiring surgery or any mandibular advancement device.

INTRODUCTION

The need for 3-Dimensional imaging in Dental Medicine has evolved in the last decade. Cone Beam Computed Tomography (CBCT) was first developed in the late 1990's, such that using a cone-shaped beam detected the 3rd dimensional plane that could be visualized by dental surgeons.

CBCT is an extra-oral head and neck imaging scanner that is comparable in size to a conventional panoramic radiography machine. The cone beam shoots x-rays in the form of a large cone, which irradiates a larger area of volume than can a conventional Computed Tomographic (CT) machine. Further, with CBCT, the numbers of rotation of the unit around the patient's head is reduced greatly in CBCT compared to a CT, which allows clinicians to obtain 2-Dimensional reconstructed images in 3-Dimensions, in all 3 planes, with relatively lower levels of radiation exposure.

The Scan Volume of a CBCT machine determines the Field of View (FOV), which classifies an individual CBCT machine into small, medium, and large volume CBCT.

- **Small Volume CBCT** can scan a sextant or a quadrant of teeth up to the size of to one jaw (Figure 1a)
- **Medium Volume CBCT** can scan both jaws (Figure 1b)
- **Large Volume CBCT** can visualize the entire head and neck (Figure 1c)

The applications in dentistry of the various scan volumes are as follows (Nasseh, 2018):

- **The Small Volume FOV** obtains a higher resolution image due to reduced x-ray scatter (noise), which greatly aids in many endodontic applications such as visualizing dental root canal configurations, detecting missed canals, and evaluating vertical and horizontal root fractures.