“Please don’t move”—Cone Beam Computed Tomography for Obstructive Sleep Apnea Hypopnea Syndrome

Isabelle Dupuy-Bonafé[a]; Igor Lima Maldonado[b-d]

[a] Department of function/dysfunction. Montpellier University Hospital, Dental Care Center, Montpellier, France.

[b] UMR Inserm U1253, iBrain, Université de Tours, Tours, France

[c] Le Studium Loire Valley Institute for Advanced Studies, Orleans, France

[d] Department of Diagnostic and Interventional Neuroradiology, Bretonneau University Hospital, Tours, France

We read, with great interest, the article “Computerized measurement of the location and value of the minimum sagittal linear dimension of the upper airway on reconstructed lateral cephalograms compared with 3-dimensional values” (Alwadei AH, Galang-Boquiren MTS, Kusnoto B, Viana MGC, Lin EY, Obrez A, Evans CA, Masoud AI. Am J Orthod Dentofacial Orthop 2018; 154: 780-787). Using Cone Beam Computed Tomography (CBCT), the authors described significant correlations between the minimum sagittal linear dimension on reconstructed lateral cephalograms and both the minimum cross-sectional area and the airway volume. This article was a valuable contribution to the evolving debate on the diagnostic tools for Obstructive Sleep Apnea (OSA).

Indeed, we have recently witnessed the appearance of a large number of protocols using linear or volumetric measurements through CBCT. Compared with traditional time-consuming manual cephalometries, the partial automation provided by CBCT saves considerable time and eliminates some of the operator-dependent errors. Although this is an enthusiastic evolving field, a number of issues must be discussed before affirming it as a diagnostic instrument for OSA.

An illustration of this is how the operator should deal with gravity. As mentioned by the authors, there are notable modifications in the position and form of pharyngeal structures in response to postural changes. Thus, the total volume and the cross-sectional area decrease as a natural phenomenon when the patient is lying down. Moreover, ventilation involves complex mechanisms that vary throughout the respiratory cycle. Breathing significantly modifies the shape and dimensions of the airway, a variable that has not been addressed in most protocols. In general practice, the patient is asked to not to breathe, move or swallow, and to keep the tip of the tongue behind the maxillary incisors. As a consequence, the position of the base of the tongue changes, which generates a tone that does not exist when the patient is asleep.

The head posture also has a strong influence on the posterior airspace between the base of the tongue and the pharyngeal wall. Positioning of the patient for the acquisition is therefore of paramount importance. Most CBCT systems acquire images in both standing and sitting positions. But, for better accuracy and reproducibility, it has been considered important that the Frankfurt plane be horizontal, which does not reproduce the actual clinical situation. Lastly, the morphology of the upper respiratory tract varies during sleeping, but CBCT examination is routinely performed on awake patients. Although part of the anatomical abnormalities that could be detected during sleep persist

during the day, this may considerably interfere in our decision-making process.

Short acquisition times reduce movement artifacts and will certainly enable some normalization of results and the convention of more precise protocols in the future. These improvements, however, may not surmount all the aforementioned weaknesses. Among them, we consider that there is a fundamental conceptual concern: are we moving towards static morphological diagnostic criteria for a condition that is dynamic by definition?

CONFLICTS OF INTEREST

The authors declare no conflict of interest.