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, et al. Am J Orthod Dentofacial Orthop 2018;154:780-787). Alwadei et al used cone-beam computed tomography (CBCT) and 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 the use of 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. However, this is an evolving field, and 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 to be important that the Frankfort plane be horizontal, which does not reproduce the actual clinical situation. Finally, the morphology of the upper respiratory tract varies during sleeping, but CBCT examination is routinely performed on awake patients. Although part of the anatomic 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 artefacts 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 of the aforementioned weaknesses. Among them, we consider that there is a fundamental conceptual concern: Are we moving toward static morphologic diagnostic criteria for a condition that is dynamic by definition?

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Author's response

The issues brought up in this letter are issues that many other researchers and clinicians bring up. However, I think that what should be considered is what these radiographic images are used for. In their letter, the authors referred to "the evolving debate on the diagnostic tools for obstructive sleep apnea." In my opinion, radiographic imaging of the airway will always be a screening tool, not a diagnostic one, with the exception of some images of the adenoids in children. Therefore, studying images of patients in an awake and upright position is proper because it mimics how we take these images in our everyday practice.

All of our orthodontic patients have either a 2D or a 3D image. Studies and contributions that aim to improve the screening process will provide us with a more sensitive method for referring patients with higher probability of OSA for sleep studies. This will allow for timely diagnosis and then management if an OSA diagnosis is confirmed.

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Erratum

Correction to: Gudhimella S, Ibrahim AY, Karanth D, et al. A rodent model using skeletal anchorage and low forces for orthodontic tooth movement. Am J Orthod Dentofacial Orthop. 2019; 155:254-263.

In the above-mentioned article, Figure 5 should appear as follows.