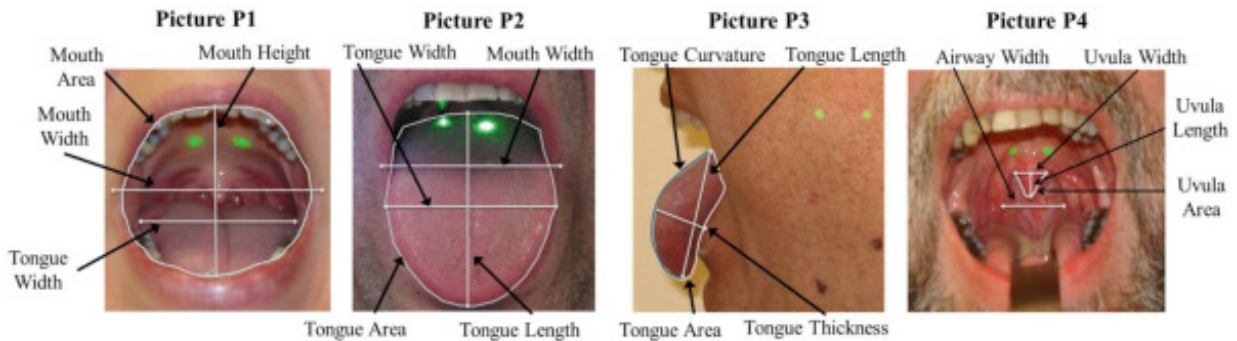# Cost-effective imaging can determine patients' OSA risk and severity

September 12 2017



Intraoral photographs with indicated measurements. The four photographs used to obtain measurements of intraoral structures are shown, with indicated measurements. The tongue within the mouth photograph (P1) shows the mouth width, height, and area and tongue width. The tongue-extended photograph (P2) shows the tongue width, length, and area as well as mouth width. The profile tongue-extended photograph (P3) shows tongue length, curvature (in blue), thickness, and area. The tongue-depressed photograph (P4) shows the uvula width, length, and area at the soft palate and airway width. Credit: *CHEST*

Obstructive sleep apnea syndrome (OSA) affects approximately 34% of men and 17% of women within the adult population. Although sex, aging, and obesity are the main factors associated with OSA, research has shown that larger tongue, lateral pharyngeal walls, tonsils, soft palate, and total pharyngeal soft tissue volumes can also be considered OSA risks.

Prior research has largely relied on calipers, which are used to measure the oral cavity and craniofacial dimensions of subjects, but there are limited data on reproducibility, and the process is generally considered cumbersome and unpleasant. Researchers from the Center for Sleep & Circadian Neurobiology aimed to reproducibly quantify pharyngeal structures by using digital morphometrics based on a laser ruler, and to assess differences between subjects with OSA and control subjects and associations with apnea-hypopnea index (AHI). This method would be a more cost-effective solution to expensive imaging like MRI and CT scans, which are normally used to assess OSA risk.

The study aimed to reproducibly quantify pharyngeal anatomy of 318 control subjects with AHI and 542 subjects with OSA and determine the differences. Using overnight polysomnography, a laser ruler, and morphometric photographs, researchers found that digital morphometrics could be used to assess the differences between subjects with OSA and control subjects and associations with AHI. Results showed that a digital camera and laser ruler can be used to quantify intraoral anatomy, particularly for measures of the tongue and mouth, airway visibility, and Mallampati score. This study also showed that measures of the tongue were larger in subjects with OSA vs control subjects in unadjusted models and controlling for age, sex, and race. Similar results were also found in patients with AHI severities.

"Digital morphometrics is an accurate, high-throughput, and noninvasive technique to identify anatomic OSA risk factors," said Dr. Richard J. Schwab, lead researcher. "Morphometrics may also provide a more reproducible and standardized measurement of the Mallampati score."
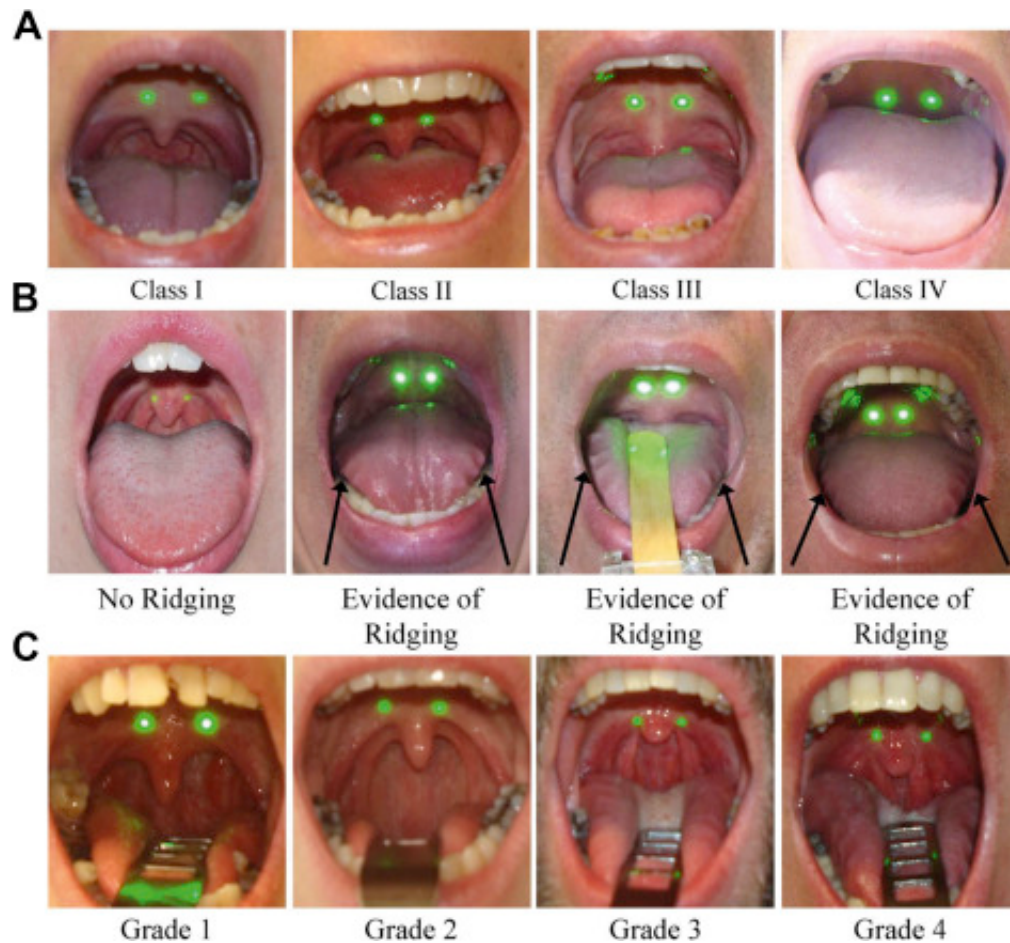
A-C, Examples of the categorical photographic variables. (A) Modified Mallampati score: Representative examples of each modified Mallampati class obtained from photograph P1 are shown. Class I indicates full visibility of the uvula and tonsillar fossa. Class II indicates visibility of the upper portion of the uvula and partial visibility of the airway. Class III indicates visibility of the hard palate and base of the uvula. Class IV indicates visibility of the hard palate and no visibility of the soft palate. In addition to modified Mallampati scores, we derived a measure of airway visibility using these photographs; the airway is visible in Class I and Class II, but it is not in Class III and Class IV. (B) Tongue ridging. Representative examples of the absence of ridging and evidence of ridging (black arrows) are shown, from photograph P1, P2, or P4. If evidence of tongue ridging is visible in any frontal intraoral photo, subjects are then graded for presence of tongue ridging. (C) Pharyngeal narrowing. Representative examples of each grade of pharyngeal narrowing are shown, from photograph P1, P2, or P4. Grades are based on the location of the intersection between the palatopharyngeal arch and the tongue, relative to tongue width. Grade 1 indicates

that the arch intersects at the edge of the tongue. Grades 2, 3, and 4 indicate that the palatopharyngeal arch intersects at 25%, 50%, and 75% or more of the tongue width, respectively. Credit: *CHEST*

**More information:** Richard J. Schwab et al. Digital Morphometrics, *Chest* (2017). [DOI: 10.1016/j.chest.2017.05.005](DOI: 10.1016/j.chest.2017.05.005)

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