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## ⊗ If Oral Breathing Does Not Determine Mask Choice for Continuous Positive Airway Pressure Delivery, What Does?

To the Editor:

As underlined by the 2020 American Thoracic Society Workshop Report, current evidence suggests that nasal masks should be the first option for the delivery of continuous positive airway pressure (CPAP) therapy for most patients with obstructive sleep apnea (1). Some patients, however, may require an oronasal mask to optimize their treatment, but evidence to support the choice is lacking. We read the study by Xavier and colleagues with interest, in particular their

hypothesis that patients for whom an oronasal mask is well adapted breathe predominantly through the nose (2).

The data provided by Xavier and colleagues suggest that oral breathing is not the main pathophysiological endotype (PE) associated with the choice of an oronasal mask, because only 1 of the 12 patients investigated breathed exclusively through the mouth (2). These results therefore raise the question, If oral breathing is not the main reason for the choice of an oronasal mask, which other PEs determine the choice?

Oronasal masks are often used to prevent mouth opening, which disturbs the patient and leads to adverse effects, in particular leaks and a dry mouth. Mouth opening may therefore be the main PE that leads to the choice of an oronasal mask. In our opinion, three main factors explain mouth opening during CPAP therapy in patients with obstructive sleep apnea:

- Nasal obstruction: Evidence supporting this is conflicting. Two pathophysiological observational studies in our group found that the choice of an oronasal mask was related to severe nasal obstruction (3, 4), although this was not found by Xavier and colleagues (2). This apparent discrepancy may be the result of differences in the severity of the nasal obstruction between the three studies. In the Xavier and colleagues study, only 1 of 12 patients was classified with severe nasal obstruction, and 4 of 12 were classified with moderate nasal obstruction (2). Current medical consensus is to treat nasal symptoms first to improve acceptance of the nasal mask and to switch to an oronasal mask only if nasal treatment fails and nasal mask tolerance remains poor (1).
- Respiratory effort: During obstructive respiratory events, the mandible drops progressively as the respiratory effort increases, which can lead to leakage through the mouth (5).
- Sleep stage: Variability in masseter tone with sleep stage could also contribute to mouth opening (5, 6).

We suggest that because oral breathing is an infrequent reason for the choice of an oronasal mask, as shown by Xavier and colleagues, clinicians should assess and manage mouth opening when possible (e.g., by treating nasal obstruction or sometimes increasing CPAP to reduce residual respiratory effort).

As interest in personalized medicine grows within the medical community, it is important to develop new tools to optimize mask selection for individual patients. We congratulate Xavier and colleagues (2) for providing new evidence regarding mask choice because this will lead to precision medicine and better patient outcomes. We fully agree with Xavier and colleagues that patients who breathe through the nose should switch to a nasal mask, but the question remains whether patients whose main problem is mouth opening should also be switched. It is our opinion that the reasons for the mouth opening should be managed first, in particular nasal obstruction and residual respiratory effort. ■

**Author disclosures** are available with the text of this letter at [www.atsjournals.org](http://www.atsjournals.org).

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## Reply to Jaffuel and Borel

From the Authors:

We thank the authors for their interest in and constructive comments on our study (1). Despite the widespread use of oronasal continuous positive airway pressure (CPAP) to treat obstructive sleep apnea (OSA), the initial choice of oronasal mask is based solely on subjective self-report of predominant mouth breathing. However, there is no agreement between self-report and objectively detected

breathing route, both when awake and during sleep (2). We agree that nasal obstruction is a major cause of mouth breathing. Specific endotypes are suggested as potential clues to guide mask choice. This scientific approach is certainly welcomed and must be widely investigated to face the current clinical reality. Mouth opening during sleep may characterize an endotype that would benefit from an oronasal mask. We have recently shown that, in contrast to control individuals, oronasal breathing while awake and asleep was common among patients with OSA (1). Oronasal breathing was associated with OSA severity, age, body mass index, and neck circumference (1). These findings are in line with the concept pointed out by the authors that increasing effort to breathe during obstructive events leads to mouth opening in patients with OSA. However, CPAP abolishes OSA and relieves respiratory effort. In concert with this view, there is evidence that most patients with OSA who breathe through the mouth during a diagnostic sleep study switch, over the period of a few months, to nasal breathing under nasal CPAP (3).

In this context, we fear that the detection of mouth opening during the first night of CPAP titration is actually a potential misleading incentive to overuse oronasal masks. Therefore, the observation of mouth opening at the diagnostic sleep study is not necessarily an indication of nasal CPAP intolerance. Mouth opening is a moving target that changes with CPAP use. Even in a single diagnostic study, mouth opening changes along sleep stages and is more common in REM, as pointed out by the authors. To finalize, the landmark study of Sullivan and colleagues 40 years ago conceived that, to abolish OSA, CPAP must be delivered through the nose because the pressure is transmitted to the back of the pharynx to splint the airway open (4). Oronasal CPAP violates this concept because positive pressure through the mouth neutralizes the splinting of the airway promoted by nasal CPAP. According to this line, we showed that oronasal CPAP is effective only when the patient breathes predominantly through the nose (1). In simple terms, an oronasal mask is often effective to treat OSA because exclusive mouth breathing is probably rare. This observation helps to explain why oronasal CPAP is in general well tolerated. One may argue that this is not a relevant question, because several patients are well adapted and prefer an oronasal mask. However, oronasal masks are more expensive than nasal masks and less effective to treat OSA, because they are associated with higher residual events despite higher CPAP levels (5). Meanwhile, we have information that in the United States, for instance, more than 30% of CPAP mask sales are oronasal masks. These numbers are in line with the observation that 28.4% of the patients with OSA in France were using oronasal masks in the InterfaceVent-CPAP study (6). The real question is why oronasal masks are so common in clinical practice. We argue that nasal interfaces should be considered the standard treatment of OSA. In our view, oronasal masks could be considered as an alternative treatment only after well-documented failure of a prolonged trial of supervised nasal CPAP. ■

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