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LETTERS TO THE EDITOR

Obstructive sleep apnea, renin-angiotensin system, and COVID-19: possible interactions

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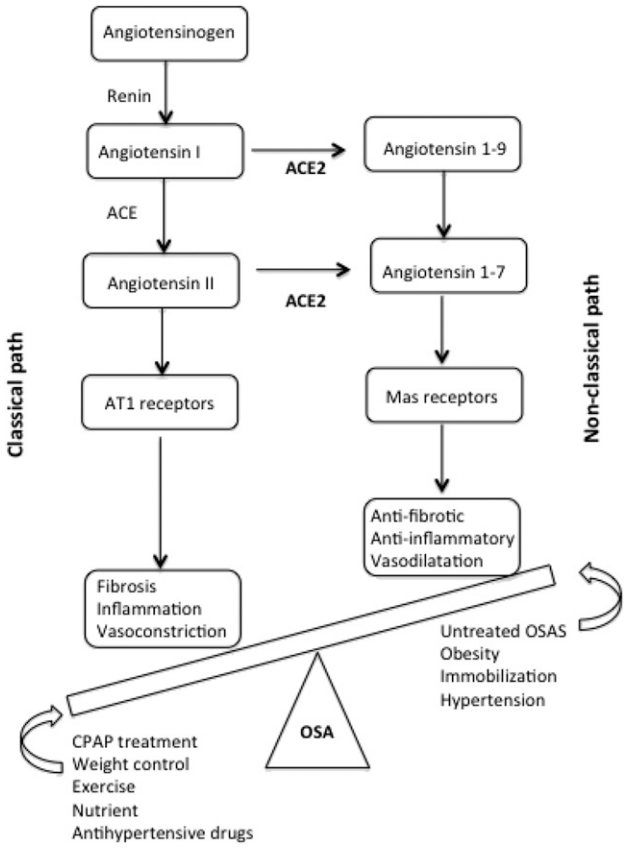
Because hypertension (HT) is a primary risk factor for severe disease and mortality in the ongoing coronavirus disease 2019 (COVID-19) pandemic, the renin-angiotensin system (RAS) is of much greater concern as the main underlying physiopathology of HT.[1] However, obstructive sleep apnea (OSA), repetitive episodes of complete/partial cessation of airflow (breathing) during sleep, is associated with dysregulation of the RAS, and HT is a significant comorbidity among patients with OSA.[2] Accordingly, in this report, we draw attention to the possible interactions among OSA, RAS, and COVID-19.

Describing the RAS is helpful to better explain these interactions. The RAS has 2 primary pathways: classical and nonclassical. In the former, angiotensinogen is converted to angiotensin I by renin that is secreted from the kidneys. Then angiotensin I is converted to angiotensin II by the angiotensin-converting enzyme (particularly in the lungs). Angiotensin II primarily acts via its receptor, AT1, which exerts fibrotic, inflammatory, vasoconstrictor, and atrophic effects. In the nonclassical pathway, angiotensin II is converted to angiotensin 1-7 via angiotensin-converting enzyme 2 and acts via Mas receptors, which, contrary to AT1, have antifibrotic, anti-inflammatory, and antiatrophic impacts (**Figure 1**).[1]

Angiotensin-converting enzyme 2 is the entry receptor of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Angiotensin-converting enzyme 2, the nonclassical pathway of the RAS, counters the classical pathway.[1,2] Notably, the RAS is involved in the pathogenesis of COVID-19, and HT is a strong risk factor in this sense.[1] From this point of view, the possible associations between OSA and COVID-19 have been put forward in a brief report.[2] Herewith, there are also dysregulations of the RAS in OSA patients. In a meta-analysis of the RAS in patients with OSA, OSA was associated with higher levels of angiotensin II and aldosterone, particularly in patients with HT.[3] In another study, increased angiotensin-converting enzyme activity was highlighted in patients with untreated OSA, regardless of the presence of HT.[4] Further, the severity of nocturnal hypoxemia in OSA augments renal RAS activity.[3,4] In addition, obesity, a significant comorbidity in OSA patients, also influences the RAS.[5]

Figure 1—Renin-angiotensin system pathways.



ACE = angiotensin-converting enzyme, ACE2 = angiotensin-converting enzyme 2.

In conclusion, we suggest that RAS dysregulation occurs in OSA patients, which may have deleterious influences on OSA patients who contract COVID-19. Therefore, complying with CPAP treatment, appropriate nutrition, proper exercise, and weight control regimens may regulate the RAS in patients with OSA to reduce the risk of COVID-19. However, this matter needs to be further investigated.

CITATION

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DISCLOSURE STATEMENT

All authors have seen and approved the manuscript. The authors report no conflicts of interest.