



Lecture Code : HV01-S2

Session Name : Hypertension and Vascular Biology

Session Topic : Hypertension and Vascular Biology

Date & Time, Place : June 13 (Sat) / 08:30-10:10 / Room 3 (GBR 103), 1F

Obstructive Sleep Apnea in Hypertension and CKD

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Obstructive sleep apnea (OSA) is highly prevalent but frequently underdiagnosed in patients with hypertension and chronic kidney disease (CKD). The intersection of these conditions forms a bidirectional vicious triad, where each disease process fundamentally accelerates the progression of the others. The reciprocal link is driven by distinct pathophysiological pathways. OSA worsens hypertension and CKD through chronic intermittent hypoxia and sleep fragmentation, which hyperactivate the sympathetic nervous system and the renin-angiotensin-aldosterone system (RAAS). This cascade induces nocturnal blood pressure surges, endothelial dysfunction, and oxidative stress, leading to glomerular hypertension and tubulointerstitial fibrosis. Conversely, CKD predisposes patients to OSA via uremic neuropathy and rostral fluid shift, where overnight recumbency displaces fluid from the lower extremities to the neck, increasing upper airway collapsibility. Recent epidemiological data show that OSA prevalence escalates with advancing kidney disease, rising from ~28% in CKD Stage 3 to over 70–85% in advanced CKD and end-stage renal disease (ESRD). Severe OSA is associated with a nearly 3-fold higher risk of rapid eGFR decline and over a 4-fold increase in cardiovascular mortality when combined with renal insufficiency. While continuous positive airway pressure (CPAP) therapy effectively lowers nocturnal blood pressure and sympathetic tone, recent meta-analyses of randomized trials indicate limited efficacy for CPAP alone in reversing established eGFR decline or albuminuria. Notably, successful volume management or kidney transplantation dramatically mitigates OSA severity by resolving uremia and fluid overload. OSA is a critical, modifiable risk factor for refractory hypertension and CKD progression. Proactive screening should be integrated into nephrology care. Effective management requires a multimodal approach combining CPAP with aggressive fluid volume optimization to disrupt the rostral fluid shift and improve long-term cardiorenal outcomes.

Keywords: sleep apnea, hypertension, ckd