

Blood Pressure Variability With and Without Supplemental Oxygen During CPAP Withdrawal

Background:

Obstructive sleep apnoea (OSA) causes elevated mean blood pressure (BP) and increased blood pressure variability (BPV), which are both independent cardiovascular risk factors. We previously reported that in patients on CPAP, supplemental oxygen overnight abolishes the morning rise in mean BP that occurs following withdrawal of their CPAP, but its effect on BPV is unknown. We aimed to assess the effect of supplemental oxygen on BPV during CPAP withdrawal.

Methods:

We conducted an exploratory analysis of a single, tertiary centre, double-blind, crossover trial (1). Participants had moderate to severe OSA, and good CPAP usage (>4 hours/night). Participants stopped CPAP for 14 days and received supplemental oxygen or sham (air) at a flow rate of 5 L/min before crossing over to the alternative treatment, with randomised treatment order. Our outcomes were the short-term BPV during office visits, and day-to-day home BPV. On days 0 and 14, office BP measurements were performed in triplicate to assess short-term BPV, and the change in the standard deviation (SD) of these three values was compared, oxygen vs. sham. Participants measured their BP at home in triplicate daily and these values were averaged; and the SD of these 10 averaged home daily BP (from days 4-13) was compared, oxygen vs. sham.

Results:

Twenty-five participants were included with mean \pm SD age of 62.7 ± 6.9 years, body mass index of 35.3 ± 6.7 kg/m², and median (interquartile range) oxygen desaturation index (4%) of 48.0 (25.3–68.2) at diagnosis. The main results are summarised in the Table. Despite supplemental oxygen significantly attenuating the rise in mean SBP and DBP, both for office and home recordings (as in our original publication (1)), there was no significant difference in either short-term office BPV, or day-to-day BPV, oxygen versus air.

Conclusion:

Although supplemental oxygen therapy during CPAP withdrawal virtually abolished the rise in mean BP, it had no significant effect on BPV. It has been previously shown that CPAP withdrawal increases BPV during office visits, but not day-to-day BPV (2). Our results show that supplemental oxygen does not attenuate this increase in office intravisit BPV, despite attenuating the mean BP. BPV was highly variable between individuals in our study, and definitive studies utilising continuous blood pressure monitoring are needed.

1. [AJRCCM 2019;199:211–219.](#)
2. Respiration 2017;93:311-318.

Office blood pressure											
Air					Oxygen				Mean	95% CI	p-value
	Base	Follow-up	Mean (95%CI)	p-value	Base	Follow-up	Mean (95%CI)	p-value			
Mean office SBP (mmHg)	128.0 ±13.7	134.8±15.5	6.8 (2.8 to 10.8)	0.002	132.4±16.7	130.9±15.3	1.5(-6.2 to +3.2)	0.508	-8.3	(-15.4 to -1.3)	0.022
SD office SBP (mmHg)	4.6±2.6	6.6±6.8	2.1(-1.2 to +5.3)	0.199	4.8±3.1	6.4±4.1	1.5(-0.2 to +3.3)	0.076	-0.5	(-4.1 to +3.1)	0.769
Mean office DBP (mmHg)	78.9±9.9	84.0±9.2	5.1 (1.5 to 8.6)	0.007	80.8±9.4	79.6±8.2	-1.2 (-4.4 to +2.0)	0.450	-6.3	(-11.0 to -1.6)	0.011
SD office DBP (mmHg)	4.0±3.2	4.2±3.5	0.2 (-1.9 to +2.3)	0.863	3.1±1.8	3.9±2.2	0.9(-0.2 to +1.9)	0.104	0.7	(-1.6 to +3.0)	0.546
Mean office HR (bpm)	65.6±11.9	67.8±14.0	2.2 (-1.3 to +5.7)	0.216	66.3±13.5	67.6±13.0	1.3(-1.2 to +3.8)	0.279	-0.8	(-4.1 to +2.5)	0.609
SD office HR(bpm)	2.1±1.2	2.2±1.5	0.1(-0.6 to +0.8)	0.869	2.1±1.3	2.3±1.5	0.2(-0.6 to +0.9)	0.653	0.1	(-0.8 to +1)	0.803
Home blood pressure											
Air					Oxygen				Mean	95% CI	p-value
Mean home SBP (mmHg)	134.5 ±14.5				128.4±12.9				-6.2	(-8.6 to -3.7)	<0.001
SD home SBP D4-14 (mmHg)	7.8±4.2				6.9±2.6				-0.9	(-2.4 to +0.5)	0.188
Mean home DBP D4-13 (mmHg)	83.9±8.5				79.9±7.9				-4	(-5.9 to -2.0)	<0.001
SD home DBP D4-13 (mmHg)	5.3±3.3				4.9±1.9				-0.4	(-1.5 to +0.8)	0.529
Mean home HR D4-13 (bpm)	65.2±8.5				63.8±8.1				-1.4	(-3.1 to +0.3)	0.105
SD home HR D4-13 (bpm)	4.7±3.1				4.5±2.8				-0.2	(-1.1 to +0.8)	0.738