

## Supplementary Data

**Table S1.** Anthropometric and polysomnography data of patients with obstructive sleep apnea without a low arousal threshold (n = 706).

| Categorical variables          |                  | Categorical variables                      |               |
|--------------------------------|------------------|--------------------------------------------|---------------|
| Age (years)                    | 46.29 ± 11.5     | <b>Sleep architecture</b>                  |               |
| Sex (male/female) *            | 656/50           | Sleep efficiency (%)                       | 77.13 ± 13.09 |
| BMI (kg/m <sup>2</sup> )       | 30.05 ± 4.93     | NREM (% of TST)                            | 86.75 ± 6.73  |
| Neck circumference (cm)        | 40.83 ± 4.55     | REM (% of TST)                             | 13.25 ± 6.73  |
| Waist circumference (cm)       | 100.94 ± 11.77   | WASO (min)                                 | 60.95 ± 42.12 |
| <b>Body composition</b>        |                  | <b>Event Duration (s)</b>                  |               |
| Visceral fat level (score)     | 15.50 ± 4.28     | Apnea                                      | 21.79 ± 7.61  |
| Body fat percentage (%)        | 29.40 ± 6.45     | Hypopnea                                   | 25.54 ± 6.18  |
| Trunk/limb fat ratio           | 1.37 ± 0.14      | <b>Low ArTH criteria</b>                   |               |
| Muscle percentage (%)          | 18.53 ± 3.44     | AHI (events/h)                             | 59.58 ± 22.8  |
| Basal metabolic rate (kcal)    | 7269.68 ± 990.69 | minSaO <sub>2</sub> (%)                    | 73.52 ± 7.84  |
| <b>Body water distribution</b> |                  | F-hypopnea (%)                             | 60.48 ± 27.89 |
| TBW (%)                        | 48.38 ± 4.66     | <b>Sleep disorder variables (events/h)</b> |               |
| ECW (%)                        | 40.56 ± 1.22     | Oxygen desaturation index                  | 54.20 ± 23.97 |
| ICW (%)                        | 59.44 ± 1.22     | Arousal index                              | 32.10 ± 19.34 |
| E-I water ratio                | 0.68 ± 0.03      |                                            |               |
| <b>OSA severity (n, %) *</b>   |                  |                                            |               |
| Mild                           | 8 (1.13%)        |                                            |               |
| Moderate                       | 27 (3.82%)       |                                            |               |
| Severe                         | 671 (95.04%)     |                                            |               |

Definition of abbreviations—Low-ArTH: low arousal threshold; BMI: body mass index; trunk/limb fat distribution: the distribution of trunk fat mass to limb fat mass; TBW: total body water; ICW: intracellular water; ECW: extracellular water; E-I water ratio: the distribution of extracellular to intracellular water; OSA: obstructive sleep apnea; PSG: polysomnography; TST: total sleep time; NREM: non-rapid eye movement; REM: rapid eye movement; WASO: wake time after sleep onset; AHI: apnea-hypopnea index; SpO<sub>2</sub>: oxygen saturation as measured using pulse oximetry.

Data are expressed as the mean ± standard deviation.

Note: Calculation of trunk/limb fat ratio: trunk fat (kg) / limb fat (kg); Calculation of TBW (%): TBW (kg) / body weight (kg) × 100; Calculation of ICW (%): ICW (kg) / TBW (kg) × 100; Calculation of ECW (%): ECW (kg) / TBW (kg) × 100; Calculation of E-I ratio: ECW / ICW.

**Table S2.** Associations between sleep parameters and visceral fat level in patients with or without low-ArTH OSA (1850 patients with low-ArTH and 706 patients without low-ArTH).

| Categorical variables                      | $\beta$ coefficient (95% CI) |                             |
|--------------------------------------------|------------------------------|-----------------------------|
|                                            | Crude model <sup>a</sup>     | Adjusted model <sup>b</sup> |
| <b>Sleep architecture</b>                  |                              |                             |
| Sleep efficiency (%)                       | -0.90 (-1.41 to -0.39) **    | -2.39 (-4.61 to -0.18) *    |
| WASO (min)                                 | 5.44 (3.87 to 7.01) **       | 1.50 (-5.13 to 8.13)        |
| <b>Event Duration (s)</b>                  |                              |                             |
| Apnea                                      | 1.31 (0.92 to 1.69) **       | 0.34 (-1.32 to 2.0)         |
| Hypopnea                                   | -0.69 (-0.92 to -0.45) **    | -0.19 (-1.15 to 0.77)       |
| <b>Low ArTH criteria</b>                   |                              |                             |
| AHI (events/h)                             | 12.69 (11.9 to 13.48) **     | 2.03 (-1.42 to 5.47)        |
| minSpO <sub>2</sub> (%)                    | -3.79 (-4.08 to -3.49) **    | 0.73 (-0.55 to 2.01)        |
| F-hypopnea (%)                             | -5.15 (-6.01 to -4.3) **     | -2.65 (-6.37 to 1.07)       |
| <b>Sleep disorder variables (events/h)</b> |                              |                             |
| Oxygen desaturation index                  | 13.23 (12.44 to 14.02) **    | 0.11 (-3.29 to 3.52)        |
| Arousal index                              | 4.37 (3.82 to 4.92) **       | 3.37 (0.95 to 5.79) *       |

Definition of abbreviations—WASO: wake time after sleep onset; Low-ArTH: low arousal threshold; AHI: apnea–hypopnea index; SpO<sub>2</sub>: Oxygen saturation as measured using pulse oximetry.

Changes in outcomes are described in terms of a standard deviation increase in the visceral fat level.

<sup>a</sup> Simple linear regression models.

<sup>b</sup> Multivariable linear regression models were adjusted for age, sex, and body mass index.

\*P < .05; \*\*P < .01.

**Table S3.** Associations between sleep parameters and trunk/limb fat ratio in patients with or without low-ArTH OSA (1850 patients with low-ArTH and 706 patients without low-ArTH).

| Categorical variables                      | $\beta$ coefficient (95% CI) |                             |
|--------------------------------------------|------------------------------|-----------------------------|
|                                            | Crude model <sup>a</sup>     | Adjusted model <sup>b</sup> |
| <b>Sleep architecture</b>                  |                              |                             |
| Sleep efficiency (%)                       | -5.18 (-7.95 to -2.42) **    | -3.10 (-6.12 to -0.08) *    |
| WASO (min)                                 | 21.11 (12.58 to 29.64) **    | 2.97 (-6.07 to 12.02)       |
| <b>Event Duration (s)</b>                  |                              |                             |
| Apnea                                      | 4.64 (2.54 to 6.74) **       | -1.29 (-3.56 to 0.97)       |
| Hypopnea                                   | 1.53 (0.26 to 2.8) *         | -1.57 (-2.88 to -0.26) *    |
| <b>Low ArTH criteria</b>                   |                              |                             |
| AHI (events/h)                             | 10.92 (5.91 to 15.93) **     | -8.30 (-12.99 to -3.61) **  |
| minSpO <sub>2</sub> (%)                    | -2.32 (-4.1 to -0.54) *      | 3.20 (1.46 to 4.95) **      |
| F-hypopnea (%)                             | -5.95 (-10.69 to -1.21) *    | 5.79 (0.72 to 10.86) *      |
| <b>Sleep disorder variables (events/h)</b> |                              |                             |
| Oxygen desaturation index                  | 8.80 (3.73 to 13.86) **      | -10.58 (-15.21 to -5.95) *  |
| Arousal index                              | 5.61 (2.5 to 8.71) **        | -0.96 (-4.26 to 2.35)       |

Definition of abbreviations—WASO: wake time after sleep onset; Low-ArTH: low arousal threshold; AHI: apnea–hypopnea index; SpO<sub>2</sub>: Oxygen saturation as measured using pulse oximetry.

<sup>a</sup> Simple linear regression models.

<sup>b</sup> Multivariable linear regression models adjusted for age, sex, and body mass index.

\*P < .05; \*\*P < .01.

**Table S4.** Associations between sleep parameters and the extracellular water to intracellular water ratio in patients with or without low-ArTH OSA (1850 patients with low-ArTH and 706 patients without low-ArTH).

| Categorical variables                      | $\beta$ coefficient (95% CI) |                              |
|--------------------------------------------|------------------------------|------------------------------|
|                                            | Crude model <sup>a</sup>     | Adjusted model <sup>b</sup>  |
| <b>Sleep architecture</b>                  |                              |                              |
| Sleep efficiency (%)                       | -30.55 (-37.48 to -23.63) ** | -24.89 (-34.14 to -15.65) ** |
| WASO (min)                                 | 83.11 (61.63 to 104.59) **   | 34.91 (7.14 to 62.68) *      |
| <b>Event Duration (s)</b>                  |                              |                              |
| Apnea                                      | -21.45 (-26.73 to -16.17) ** | -14.02 (-20.97 to -7.08) **  |
| Hypopnea                                   | -8.40 (-11.6 to -5.19) **    | -7.52 (-11.54 to -3.5) **    |
| <b>Low ArTH criteria</b>                   |                              |                              |
| AHI (events/h)                             | -55.59 (-68.17 to -43.02) ** | -37.16 (-51.54 to -22.78) ** |
| minSpO <sub>2</sub> (%)                    | 20.17 (15.73 to 24.62) **    | 16.50 (11.17 to 21.84) **    |
| F-hypopnea (%)                             | 58.2 (46.38 to 70.02) **     | 31.18 (15.63 to 46.73) **    |
| <b>Sleep disorder variables (events/h)</b> |                              |                              |
| Oxygen desaturation index                  | -61.93 (-74.58 to -49.28) ** | -45.20 (-59.38 to -31.03) ** |
| Arousal index                              | -4.86 (-12.75 to 3.02) **    | 0.86 (-9.31 to 11.03)        |

Definition of abbreviations—WASO: wake time after sleep onset; Low-ArTH: low arousal threshold; AHI: apnea–hypopnea index; SpO<sub>2</sub>: Oxygen saturation as measured using pulse oximetry.

<sup>a</sup> Simple linear regression models.

<sup>b</sup> Multivariable linear regression models adjusted for age, sex, and body mass index.

\*P < .05; \*\*P < .01.

**Table S5.** Associations (odds ratios, ORs) of anthropometric measurements between patients with OSA with or without low-ArTH

| Arousal variables (arousals/h) | Crude OR (95% CI) <sup>a</sup> | Adjusted OR (95% CI) <sup>b</sup> |
|--------------------------------|--------------------------------|-----------------------------------|
| <b>Body composition</b>        |                                |                                   |
| Visceral fat level (score)     | 0.31 (0.28 to 0.35) **         | 1.07 (0.67 to 1.72)               |
| Body fat percentage (%)        | 0.91 (0.83 to 0.99) *          | 1.28 (0.96 to 1.72)               |
| Trunk/limb fat ratio           | 0.90 (0.83 to 0.98) *          | 1.18 (1.05 to 1.33) **            |
| <b>Body water distribution</b> |                                |                                   |
| E–I water ratio                | 2.18 (1.94 to 2.45) **         | 1.78 (1.52 to 2.09) **            |

Definition of abbreviations—Low-ArTH: low arousal threshold; CI: confidence interval; trunk/limb fat ratio: ratio of trunk fat mass to limb fat mass; E–I water ratio: ratio of extracellular to intracellular water.

<sup>a</sup> Simple logistic regression models.

<sup>b</sup> Multivariable logistic regression models adjusted for age, sex, and body mass index.

\*P < .05; \*\*P < .01.