

## ***Online data supplement***

### **High-flow oxygen therapy versus non-invasive ventilation: a randomised physiological cross-over study of alveolar recruitment in acute respiratory failure**

Elise Artaud-Macari<sup>1,2,3</sup>, MD, Michael Bubenheim<sup>4</sup>, MD, Gurvan Le Bouar<sup>1,2</sup>, MD, Dorothée Carpentier<sup>1</sup>, MD, Steven Grangé<sup>1</sup>, MD, Déborah Boyer<sup>1</sup>, MD, Gaëtan Béduneau<sup>1,3</sup>, MD, Benoit Misset<sup>1,5,6</sup>, PhD, Antoine Cuvelier<sup>2,3</sup>, PhD, Fabienne Tamion<sup>1,7</sup>, PhD, Christophe Girault<sup>1,3</sup>, MD

#### **Online data supplement methods:**

##### **Study population:**

Patients were excluded if they had cardiogenic pulmonary edema, moderate to severe underlying respiratory disease including chronic obstructive pulmonary disease (COPD), contraindication to or failure of previous NIV or HFNC with the need for immediate invasive ventilation, pregnant or breast-feeding women, carriers of an implantable defibrillator or pacemaker, body mass index (BMI) >50 kg/m<sup>2</sup>, or with a cutaneous lesion next to the positioning zone of the Pulmovista<sup>®</sup> belt.

##### **EIT measurements**

EIT measurements (EELI, TV) were performed with the Pulmovista<sup>®</sup> device (Dräger, Lübeck, Germany) which had been calibrated and self-tested according to the manufacturer's instructions. EIT signal was filtered. The electrode belt was placed considering the largest consolidation area highlighted on chest X-ray or CT-scan (Figure S2). We defined 4 standardized quadrants (the same for all patients) in the thorax section: 2 anterior quadrants (ROI1 and 2), non-dependent zone, and 2 posterior quadrants (ROI3 and 4), dependent zone. EELI and TV were recorded continuously during at least 15 minutes in the different oxygenation conditions and their measurements were expressed in arbitrary units. All EIT data were saved in real time in the Pulmovista<sup>®</sup> hard drive, downloaded into a personal computer for offline analysis with Dräger review software (Dräger EIT Data Analysis Tool v6.1). For each period, after a period of breathing stabilization, EELI and TV values were averaged from data recorded during 5 minutes, and then, analyzed regionally by defining regions of interest (ROIs) according to 4 quadrants and globally (all ROIs together), including the ROI with the largest alveolar consolidation (Figure S2). EELI and TV values were recorded for each patient with HFNC, NIV and FM following an alternate plan (figure S1). We

compared EELI and TV values obtained with NIV and HFNC. For the comparison of HFNC and NIV with FM, we analyzed the FM data recorded just before HFNC or NIV period

### **Data collection**

In addition to EIT measurements (global and regional EELI and TV values), the following data were collected for each patient: age, sex, body mass index, Simplified Acute Physiology Score (SAPS) II and Sepsis Related Organ Failure Assessment (SOFA) score at ICU admission, localization of the main consolidation on chest X-ray, delay between ICU admission and inclusion, respiratory rate (RR), SpO<sub>2</sub>/FiO<sub>2</sub> ratio, heart rate (HR), systolic blood pressure (SBP), mean arterial pressure (MAP), dyspnea with Borg scale, and patient comfort with a 10-point scale (0=least comfort and 10=most comfort), length of ICU stay, need for invasive mechanical ventilation, and ICU mortality.

### **Statistical analysis**

In order to compare patients receiving NIV first with those receiving HFNC first, just before the start of period 1, i.e. at baseline, Freeman-Halton's extension of Fisher's exact test was employed for categorical variables, and Wilcoxon's test for independent samples for quantitative variables (Table S1). The latter test was also used to check for the presence of a treatment order effect, and the trend over time, i.e. the period effect, was examined with the signed rank test for quantitative variables (Table S2).

A p value < 0.05 was considered statistically significant. Statistical analyses were performed using SAS 9.4 (SAS Institute Inc., Cary, USA).