Early ventilation settings in brain-injured patients: preliminary data of VENTIBRAIN STUDY

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Mechanical ventilation is frequently used in brain injured ill patients. [1] [2]Although necessary to optimize brain oxygen delivery, mechanical ventilation may cause pulmonary and cerebral damage, leading to an increasing of morbidity and mortality.[1] [3]However, it remains poorly described how current protective lung ventilation recommendations are applied in this setting. [4]

OBJECTIVES

The primary objective of this multi-center, international, prospective, observational, cohort study was to describe the ventilatory settings and targets used in the brain injured patients during their Intensive Care Unit (ICU) stay.

METHODS

Ongoing multicenter observational study on practice of ventilation in brain injured patients (VENTIBRAIN) study. Inclusion criteria are brain injured patients ≥18 years old, admitted in ICU with a diagnosis of Traumatic Brain Injury (TBI), Subarachnoid Haemorrhage (SAH), Intracranial Haemorrhage (ICH) or acute ischemic stroke (AIS) undergoing invasive mechanical ventilation. Demographic, baseline characteristics, and ventilation settings in the first 24 hours were recorded.

RESULTS

This preliminary analysis included **295 patients** enrolled from October 2021 to January 2022. One hundred thirty-six (46.1%) were admitted with diagnosis of TBI, 98 (33.2%) of SAH, 53 (18 %) of ICH, and 8 (2.7%) of AIS. At the first neurological evaluation, patients had a median motor Glasgow Coma Scale score of 3 (2-5). **Median tidal volume** (TV) was **500** (445-560) mL, median TV per ideal body weight was 7.15 (6.37-8.22) mL/Kg, positive end-expiratory pressure (PEEP) 6 (5-8) cmH_20 and **inspiratory plateau pressure 20** (17-24) cmH_2O. **Median compliance** of respiratory system was **40** (31-50) mL/cmH_2O and driving pressure 13 (10-16) cmH_2O. The median arterial partial pressure of oxygen/ fraction of inspired oxygen ratio was 195 mmHg (IQR 112.8-307.9).

Table 1. Baseline characteristics of patients at ICU admission

	Overall (n=295)
Baseline patient characteristics	
Age, years, median (IQR)	65 (55; 74)
Gender, female, n (%)	135(45.7)
Height, cm, median (IQR)	175 (170; 180)
Weight, kg, median (IQR)	80 (73; 90)
BMI, kg/m^2, median (IQR)	26.3 (24.1; 29.7)
Chronic comorbidities	
Hypertension, yes, n (%)	87(29.5)
Diabetes mellitus, yes, n (%)	43(14.6)
Cardiological hystory, yes, n (%)	24(8.1)
Smoke, yes, n (%)	65(22)
COPD, yes, n (%)	26(8.8)
Cancer, yes, n (%)	3(1)
Type of brain injury	
TBI n (%)	136(46.1)
SAH n (%)	98(33.2)
ICH n (%)	53 (18)
Stroke n(%)	8(2.7)
GCS motor ,median (IQR)	3 (2-5)

Table 2. Ventilatory settings at ICU admission

Respiratory rate, breaths/min, median (IQR)	16.0 (14.0; 20.0)
Positive end-expiratory pressure, cmH_2O, median (IQR)	6.00 (5.00; 8.00)
Plateau pressure, cmH_2O, median (IQR)	20.0 (17.0; 24.0)
Tidal volume, mL, median (IQR)	500 (445; 560)
Tidal volume, mL/kg PBW, median (IQR)	7.15 (6.37; 8.22)
Driving pressure, cmH_2O, median (IQR)	13.0 (10.0; 16.0)
Compliance of the respiratory system, mL/cmH_2O, median (IQR)	40 (31; 50)
Gas exchange	
Fraction of inspired oxygen (FiO_2), %, median (IQR)	60 (50; 88)
PaO_2, mmHg, median (IQR)	108.7 (83.2; 163.0)
PaO_2/ FiO_2 ratio, mmHg, median (IQR)	195.0 (122.8; 307.3)

CONCLUSIONS

This preliminary analysis shows that acute brain-injured patients during the first 24 hours in ICU are usually ventilated with a lung protective approach using low tidal volumes, low to moderate PEEP and low inspiratory plateau pressure.

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