

Physiological cardiorespiratory parameters in a model of anesthetized pigs with preserved spontaneous breathing: A prospective translational pilot trial.

Riesenhuber Martin, Gugerell Alfred, Traxler Denise, Spannbauer Andreas, Prömer Jakob, Zlabinger Katrin, Winkler Johannes, Gyöngyösi Mariann

Medical University of Vienna, Department of Internal Medicine II, Division of Cardiology, Währinger Gürtel 18-20, 1090 Vienna, Austria.

### Introduction

Cardiac resynchronization therapy (CRT) is a valuable treatment for patients with heart failure with reduced ejection fraction and intraventricular conduction disturbances resulting in wide QRS complexes. However, the rate of CRT-non-responders is high. Up to now, heart rate adaptation as well as atrioventricular and interventricular conduction has a poor dynamic range. Restoration of respiratory sinus arrhythmia with cardiac chamber synchrony and could increase cardiac output. The aim of the present project was to evaluate the resting and exercise-induced respiratory and hemodynamic physiological variables under experimental conditions for promoting a development of a new pacemaker sensor in a later phase of the European Union supported CresPace project (grant number 732170).

### Methods

Physiological baseline data of 13 anesthetized, intubated and spontaneous breathing pigs (30-40kg body weight) were collected. Anesthesia was induced according to the protocol approved by the local Ethical Committee. Single-lead ECG was measured in 11 pigs by BioAmp (ADInstruments, Oxford, UK). Invasive blood pressure was measured in 13 pigs by a sheet introduced in the femoral artery. Respiratory volume, respiratory rate, respirator gas flow and fraction of inspired oxygen ( $\text{FiO}_2$ ) were measured in 13 pigs. Arterial blood gas analysis (pH,  $\text{pCO}_2$ ,  $\text{pO}_2$ , lactate,  $\text{HCO}_3^-$ , base excess, arterial oxygen saturation) was obtained in 13 pigs. Descriptive statistics with means and standard deviations were calculated.

### Results

Results of ECG recordings are displayed in Table 1. Respiratory rate and volume were  $39 \pm 9$ /min and  $4.1 \pm 1.0$ l/min, respectively. Invasive systolic and diastolic blood pressure were  $130 \pm 11$ mmHg and  $110 \pm 10$ mmHg, respectively. Arterial blood gas analysis was conducted with a mean  $\text{FiO}_2$  of  $30 \pm 0\%$  and a mean gas flow (respirator) of  $2.2 \pm 0.2$ l/min. According to these setting,  $\text{pO}_2$ -levels of  $144.7 \pm 11.7$ mmHg and an arterial oxygen saturation of  $100 \pm 0\%$  were achieved. Further results of the arterial blood gas analysis were: pH  $7.39 \pm 0.03$ ;  $\text{pCO}_2$   $55.1 \pm 4.5$ mmHg; lactate  $1.2 \pm 0.6$ mmol/l;  $\text{HCO}_3^-$   $31.0 \pm 1.9$ mmol/l, base excess  $7.7 \pm 2.5$ mmol/l.

### Conclusion

Physiological parameters of the cardiorespiratory system stayed constant within the setting of anesthesia with preserved spontaneous breathing. As a next step, invasive sensors for an improved CRT will be tested and reported. Data of sensor testing will be presented at EUSTM-2019 in October 2019.

This work was financially supported by the European Union's Horizon 2020 Future Emerging Technologies Programme (CresPace, grant number 732170).

Conflicts of interest: None.

Word count: 372 out of 450 words

<b>Parameter</b>	<b>Mean (SD)</b>
RR Interval (ms)	687 (81)
Heart Rate (bpm)	88 (10)
PR Interval (ms)	105 (10)
P Duration (ms)	48 (7)
QRS Interval (ms)	57 (13)
QTc (ms)	443 (26)
P Amplitude (mV)	0.17 (0.06)
R Amplitude (mV)	0.99 (0.38)
T Amplitude (mV)	0.42 (0.16)

Table 1: Results of single-lead ECG recordings (n=13) in anesthetized, intubated, spontaneous breathing land race pigs. (SD – standard deviation, ms – milliseconds, mV – millivolts)