Spontaneous hypertrophic cardiomyopathy in pigs: a possible cause of misleading results in porcine models of cardiac arrest and cardiopulmonary resuscitation

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BACKGROUND AND PURPOSE

Experimental models of cardiac arrest (CA) and cardiopulmonary resuscitation (CPR) are essential to broaden knowledge about the underlying pathophysiology of CA and thus improve CPR techniques.

Porcine models provide clinically relevant data and represent 40% of the experimental models of CA-CPR.

Porcine **hypertrophic cardiomyopathy (HCM)** is an autosomal dominant disease with an estimated frequency between 5 and 23% depending on breed.

Here we depict the complications associated to non-intentional inclusion of pigs with spontaneous HCM in a porcine model of CA-CPR.

METHODS

Fifteen Landrace-Large White female pigs underwent a 5-minute CA followed by cardiopulmonary resuscitation according to the current Guidelines of the European Resuscitation Council.

Animal preparation

- Electrocardiography (EKG).
- Orotracheal intubation.
- Femoral artery: Invasive arterial pressure measurement (IAP).
- Jugular vein: Electrical-stimulation catheter placement in the right heart; drug administration.

Monitoring

Heart rate and arterial pressure were recorded at baseline and each 2 minutes during the CPR protocol.

CA-CPR protocol

Cardiac arrest	CPR manoeuvres until return of spontaneous circulation (ROSC) or for 20 minutes
- Ventricular fibrillation	- Mechanical ventilation: FiO_2 : 1,00; PEEP: 0 mmHg; TV: 8 ml / Kg
- 5 minutes	- Chest compressions with LUCAS (100 compressions / min)
- Apnea	- External defibrillations (200 J) each 2 min
	- Intravenous adrenaline (1 mg / bolus)

All animals underwent a systematic necropsy of the thorax after finishing the experiment.

RESULTS

Resuscitation outcomes

All animals were instrumented and were arrested for 5 minutes.

Thirteen out of 15 animals presented ROSC after 7.4 ± 4.4 minutes of standard CPR manoeuvres. However, 2 animals were unable to resuscitate after 20 minutes of CPR.

External defibrillations and adrenaline administration during CPR

Arterial pressure during CPR

Necropsy macroscopic findings

The 2 animals that were unable to resuscitate presented a hypertrophic heart.

CONCLUSIONS

In a porcine model of 5-minutes CA, standard CPR resulted in ROSC in healthy pigs, but was **ineffective** in two pigs with **HCM**.

The non-intentional inclusion of pigs with spontaneous HCM in experimental models of CA-CPR can lead to misleading conclusions when a complete heart inspection in necropsy is not performed.

The authors have no conflict of interest to declare.

This work was financed by the Consell Català de Recerca i Innovació Tecnològica (2016).