DIFFERENCES BETWEEN ARTERIAL, VENOUS AND INTRAOSSEOUS BLOOD SAMPLES IN POINT-OF-CARE ANALYSES DURING EXPERIMENTAL CPR

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Purpose of the study

Resuscitation guidelines recommend assessing and correcting reversible causes of cardiac arrest (CA) during cardiopulmonary resuscitation (CPR) i.e. by using the 4 H's and 4 T's rule.

Point-of-care (POC) laboratory analyses could probably supplement clinical information in screening pre-arrest pathologies, i.e. electrolyte disorders, acid-base balance disturbances and abnormal haemoglobin levels.

Because arterial or venous blood samples may be difficult to obtain during CPR, we aimed to study how POC samples from intraosseous (IO) space during resuscitation resemble the pre-arrest arterial values.

Materials and methods

T0 Blood sample from femoral artery at baseline before induction of VF
T1 Blood samples from femoral artery, central vein and IO space 5 minutes after initiation of CPR
VF Ventricular fibrillation, untreated
CPR Ventilation 10/min (FiO₂ 50% or 100%) and chest compressions (100/min) with LUCAS™

We used an experimental resuscitation model with 23 anaesthetised pigs. The Finnish National Animal Experiment Board (ESAVI/1077/04.10.07/2016) approved the study plan.

We took baseline blood samples from artery before electrically inducing VF and compared the baseline arterial samples with arterial, venous and IO-samples taken after 5 minutes of CPR, which was started after 7 minutes of untreated CA. We used iSTAT® POC device for analyses and Friedman's two-way ANOVA and its post hoc pairwise comparisons with Bonferroni correction for the statistical analyses.

Results

Electrolyte and acid-base values from all sampling sites during resuscitation differ from the pre-arrest values. Figures below display the difference between arterial, IO-, and venous values during CPR compared to the pre-arrest arterial values.

ART Difference ARTERIAL CPR value (T1) – ARTERIAL BASELINE value (T0)
IO Difference IO CPR value (T1) – ARTERIAL BASELINE value (T0)
VEIN Difference VENOUS CPR value (T1) – ARTERIAL BASELINE value (T0)

* p < 0.05
** p < 0.01
*** p < 0.001

Venous, arterial and IO POC samples during CPR resemble poorly the pre-arrest values.

POC analysis of IO samples is not inferior to analyses of arterial or venous blood.