Hands Free Carotid Doppler Correlates with Cerebral Blood Flow in a Pediatric Porcine Model of Asphyxia Associated Cardiac Arrest

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Background

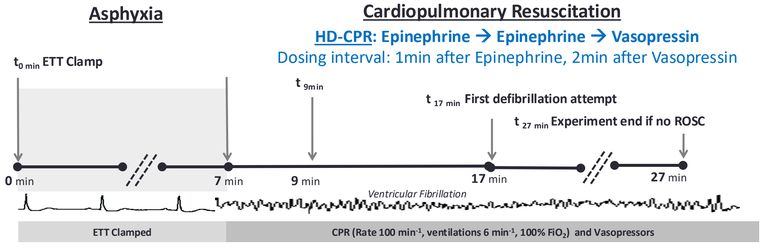
- Preservation of Cerebral Blood Flow (CBF) during Cardiac Arrest (CA) is critical for neurologically intact survival
- Carotid Doppler time averaged velocity (TAV) may be an effective, non-invasive surrogate for CBF during CA

Hypothesis and Methods

Hypothesis: Carotid Doppler ultrasound (RescueDoppler; RD) will be correlated with invasive CBF (laser Doppler flowmetry) in a swine model of asphyxia associated pediatric CA

Pediatric Swine Model of Asphyxia-Associated Cardiac Arrest:

- 4-week-old piglets underwent asphyxia (7 minutes) and VF arrest
- HD-CPR (goal SBP 90, coronary pressure 20) for 10-20 minutes
- RD probe over left common carotid
- Laser doppler through right anterior burr hole



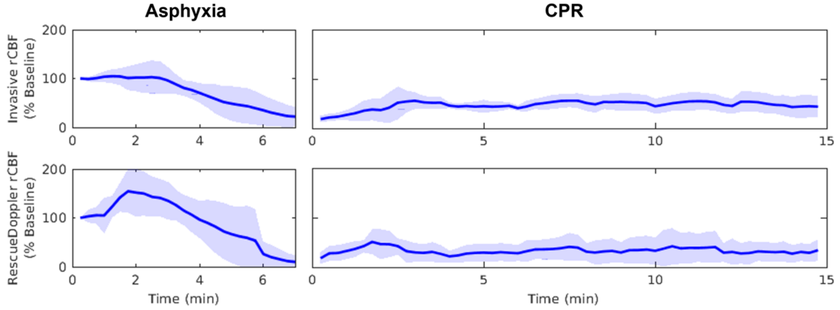
Statistical Analysis

15-second block averages during asphyxia (n=8) and CPR (n=6)

- Repeated measures correlation (association for paired measures assessed multiple times; rmcorr; 95% confidence interval)
- Linear mixed effects (quantitative relationship between devices; accounts for non-independence, Slope mean ± standard error)

Results

Mean (SD) of relative invasive CBF and relative RescueDoppler CBF during asphyxia and CPR.



	Repeated Measures Correlation	Linear Mixed Effects Modeling
Asphyxia	**0.84 (0.8, 0.87) p<0.001**	**1.3 ± 0.1% change in RD TAV per 1% change in invasive CBF (p<0.001)**
CPR	**0.31(0.22, 0.4) p<0.001**	0.2±0.2% (p=0.368)

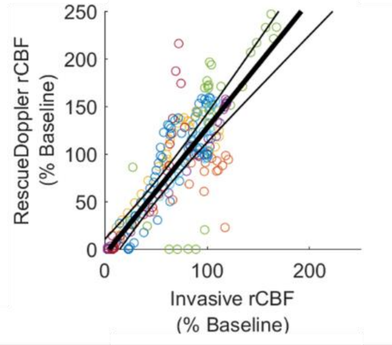
Linear Mixed Effects Models of the quantitative slope relationship between RescueDoppler (RD) and CBF during asphyxia and CPR.

Asphyxia

Linear Mixed-Effects Model

RD rCBF = 1.3 × **Invasive rCBF** - 5.6

Slope (mean ± SE) = 1.3 ± 0.1, p<0.001

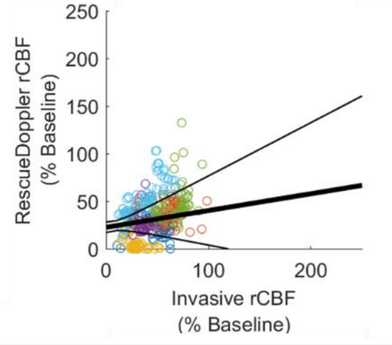


CPR

Linear Mixed-Effects Model

RD rCBF = 0.2 × **Invasive rCBF** + 22.8

Slope (mean ± SE) = 0.2 ± 0.2, p=0.368



Conclusions

- **RescueDoppler is correlated with invasive CBF during asphyxia and, to a lesser degree, during CA in pediatric swine**
- RescueDoppler is a novel, non-invasive CBF surrogate in a pediatric swine model of CA and may be a promising physiologic tool for targeted CPR to improve neurologic outcomes.

Future Directions

- Future study may be strengthened by increased dynamic range of CBF during CPR and improved device stabilization

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Charlotte B Ingul serves as Medical Advisor at Cimon Medical. Hans Torp is employed by Cimon Medical.