Comparison of Compensatory Reserve Index (CRI) and Arterial Lactate as a Marker of Shock and Resuscitation

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Disclaimer / Disclosure

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Trauma Resuscitation

• Current assessment of adequate resuscitation
  – Blood pressure
  – Heart rate
  – Urine output
  – Lactic acid
What is CRI?

- Novel means of assessing physiological reserve via arterial wave-form analysis
Compensatory Reserve

Progressive Central Volume Loss

Point of Decompensation

Death

Compensatory Reserve

Decompensatory Reserve

Time

Moulton et al. 2013
Major Hemorrhage

• Study devised to test CRI in a controlled large (1.2L) hemorrhage model

• Involved graded reduction of blood volume in 25 healthy subjects

• Various parameters including heart rate and blood pressure were also assessed
Results

Convertino et al. 2014
Resuscitation

• Restoration of compensatory reserve following replacement of circulating volume

• Suggests the algorithm could provide a monitoring capability for guiding controlled resuscitative strategies
CRI Trends During Volume Changes

Convertino et al. 2014
High Versus Low Tolerance

• Subgrouping of patients by their ability to employ several physiological mechanisms to delay the onset of decompensation

• CRI has been shown to differentiate these patient populations over other parameters (Vital signs, Lactate, Shock Index, etc.) used to monitor volume status

• Better appreciation of patients more sensitive to volume changes and more susceptible to early decompensation
Goals

• Assess the compensatory reserve index’s ability to predict adequate resuscitation via a known endpoint of resuscitation: Lactate
Methods

• Previously IRB approved prospective observational study

• Lactate levels were time correlated with corresponding CRI values

• Analyze predictive capacity of initial values to predict hemorrhage

• Analyze correlation between change in lactate with change in CRI
Demographics

- **Age**
  - 43.8 years

- **Gender**
  - Male: 52.4%

- **Ethnicity**
  - Hispanic: 52%

- **Mechanism**
  - Blunt: 86.6%

- **ISS**
  - 8.84
ROC Curves

- LacticAcid ROC area: 0.8246
- CRI_inv ROC area: 0.8052

p = 0.8015
n = 82
Results

Coefficient = -0.73 (p < 0.01)
Conclusions

• CRI showed a strong inverse correlation to lactate during acute resuscitation

• CRI performed with equivalent predictive capacity to lactate with respect to identifying hemorrhage

• Unlike lactate, CRI was non-invasive and available immediately and continuously
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