Lactate and Paediatric Trauma

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Objectives

- Place paediatric trauma into a military context
- Review the literature surrounding lactate in trauma
- Propose research methodology
Battle of Agincourt – Oct 1415
Adult VS Child

- Adult: 76%
- Child: 24%
Sex of child

- Male
- Female
- not recorded
Paediatric Age Groups

- 0-1 years
- 2-4 years
- 5-10 years
- 11-16 years
Mechanism of Injury

- IED
- GSW
- MVC
- Burn
- Drowning
- Fall
- Other
Injuries

- SHI
- Burn
- Cardiac arrest
- Ado
- Amputation
- Chest Inj
“Even for those who regularly see injured children in the UK, the numbers injured, mechanisms, type and severity of injury are different from their normal experience”

Walker et al (2010)
“Whilst the numbers of case were small (2%) the effect on the field hospital were considerable. There is evidence that medical staff may over triage children and the high proportion (19%) of ITU admission may reflect this”

Heller (2004)
10 years in Iraq & Afghanistan

Creamer et al (2009)

- 10% overall workload children
- Children represented 50% of the overall civilian admissions
- Penetrating trauma predominated (76.3%)
- GSW – 39%
- Blast injury – 32%
Uniqueness of children

“Anatomical differences of size, weight and relative proportions mean that children often suffer a greater number of injuries especially to the head and torso that would be expected from an adult exposed to the same kinetic force”

Nordmann et al (2010)
Paediatric Resuscitation

“Early aggressive resuscitation, avoidance of hypothermia, acidosis and coagulopathy, together with timely surgical intervention is required”

Nordmann et al (2010)
Cosgriff et al (1997)
Trauma in the young & healthy

Studies have shown a lack of correlation of HR and sBP with the amount of haemorrhage present

Lactate & normal vitals

Serum lactate level was elevated (4.61 mmols/L) - HR and sBP was within normal limits – RR was elevated

Suggested that hypoperfusion was occurring

Caputo et al (2013)
“I intend to establish, just as there is an alcoholic ferment, the yeast of beer, which is found everywhere that sugar is decomposed into alcohol & carbonic acid, so also there is a particular ferment a lactic yeast, always present when sugar becomes lactic acid “

Louis Pasteur 1857
Definition of Lactate levels

- Normal lactate levels - < 2.0 mmols/L
- High lactate levels - > 4.0 mmols/L

Anderson et al (2013)
Raised lactate & mortality

Correlation between lactate &:

- Increased mortality
- Morbidity
- Length of stay

Lactate clearance

Elevated lactate levels on admission & duration of hyperlactatemia is related to post-traumatic complications


Initial lactate strongly correlated to mortality - & clearance

Odom et al (2012)
How long....

- Regnier et al (2012) - 0-2 hours
- Odom et al (2012) - 6 hours
- Husain et al (2003) - 24 hours
Summary

- Many studies indicate that lactate is a good indicator of hypoperfusion in trauma and should guide resuscitation.
- Lactate clearance is important to indicate continuing resuscitation and outcome.
- Maybe useful of occult hypoperfusion in the young & healthy with good physiological reserve.
- Not clear in its use in children.
Research Question

“Is lactate an effective biochemical indicator of severe injury in children with major trauma?”
Proposed methodology

- 1 year retrospective study of paediatric trauma patients (excluding burns, existing metabolic disorder, illness) – with ISS > 15
- Numbers initial will be accessed via ‘Tarnlet’
- Basic demographic will be obtained
Methodology continued

Initial lactate then:
6 hours, 12 hours, 24 hours and when ‘normalized’

Correlated to:
HR, MAP, Temp, HCT, BE, Cr and EGFR (if recorded), LoS, mortality, & lactate clearance.
Lactate clearance (Munde et al 2014)

\[(\text{initial lactate} - \text{current lactate}) \times 100 / \text{initial lactate}\]

Positive value - denotes lactate clearance

Negative value – denotes increased lactate
Some questions to be answered

- Head injuries
- Non-Accidental injuries
- Gang related injuries eg stabbing, GSW
Any Questions?
References