Pre-hospital lactate in trauma patients: What are we measuring?

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E. Ter Avest*, J.Griggs, J.Wijesuriya, M.Q. Russell, R.M. Lyon
Air Ambulance Kent Surrey Sussex
EwoudterAvest@aakss.org.uk

INTRODUCTION

Trauma triage and risk stratification is a challenging component of pre-hospital emergency medicine. Point of care serum lactate measurement is emerging as an adjunct to pre-hospital clinical assessment and has the potential to guide triage and advanced treatment decision- making. However, factors influencing pre-hospital lactate and the influence it has on clinical decision-making and pre-hospital care remain poorly understood.

OBJECTIVE

The aim of the present study was to evaluate which patient- and treatment factors are related to lactate formation in pre-hospital trauma patients, and determine their relative contribution to the measured lactate level.

METHODS

- Retrospective study of all trauma patients in whom lactate was measured prehospital.
- Study period: July 13th 2017- April 24rd 2018.
- Non-urban HEMS (Air ambulance Kent Surrey Sussex)

- Lactate measurement: NOVA StatStrip® Biomedical Xpress™ Lactate Meter system [1].

RESULTS AND DISCUSSION

Patients
- 156 trauma patients with lactate being measured.
- Predominantly blunt trauma (89.7%).
- Lactate measured on average 66 [46-87] minutes after 999 call.

Lactate
- 96 patients (61%) with elevated lactate (>2.5 mmol/l).
- Patients with elevated lactate levels had:
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- -A higher incidence of head injuries (62 vs 41%, p=0.008).
- -A lower SBP, a higher HR and a higher shock index
- (0.80 [0.58-1.03] vs 0.61 [0.40-0.82] p<0.001).
- -Lower SpO2 (96 [89-100] vs 98 [96-100]%, p=0.025).
- -Less often iv analgesia (51.6% vs 67.2%, p=0.03).

FIGURE 1 Univariate correlation of lactate with patient & treatment variables

	Lactate (mmol/l)		Lactate>2.5 mmol l/l	
	r	p	r	p
Biometric data				
Age (y)	.003	.974	-.037	.643
Gender (n,%male)	-.025	.758	-.016	.844
Injury/ disease characteristics				
Mechanism	.092	.255	.054	.500
Nr Body regions affected	.110	.176	.099	.220
Head (n,%)	.221	.006	.221	.006
Chest (n,%)	.005	.950	-.055	.495
Abdomen (n,%)	-.029	.718	-.022	.782
Limb (n,%)	-.032	.688	.009	.915
999-lactate sample (min)	.117	.197	.073	.422
Indices of end-organ perfusion and oxygenation				
Palpable radial pulse [y]	-.287	<.001	-.166	.038
SBP (mmHg)	-.308	<.001	-.282	.001
HR (bpm)	.210	.011	.188	.023
Shock index	.346	<.001	.336	<.001
First ETCO$_2$ (kPa)	-.156	.101	-.082	.392
SpO$_2$	-.235	.005	-.190	.024
Treatments before HEMS				
Circ and resp support				
Adrenalin	.114	.155	.092	.254
IV fluids	.165	.040	.160	.046
Pain relieving interventions				
IVP and/or morphine	-.240	.003	-.185	.021
IVP	-.177	.027	-.165	.039
Morphine	-.164	.040	-.086	.288
Reduction or splinting*	.097	.227	.113	.161
Haemostatic interventions				
Pelvic splint	.054	.502	.045	.576
Compression bandage or tourniquet	-.123	.126	-.070	.384
TXA	.117	.147	.087	.278

Multivariate analysis

- Explained variance of final model low (17.7%)
- IV Analgesia was an independent predictor of lactate.
- Indices of end organ perfusion and oxygenation
- only explained 15.1% of the variation in lactate levels

CONCLUSION

Abnormal lactate values are likely to represent the complex interaction between multiple physiological and pathophysiological processes and medical interventions. In the pre-hospital setting, it may be difficult to determine which of these processes is occurring and to what extent, for a particular trauma patient. Pre-hospital clinicians should be cautious about basing advanced treatment decisions on pre-hospital lactate measurements.

REFERENCES

[1] Colon-Franco JM, Lo SF, Tarima SS, Gourlay D, Drendel AL, Brook Lerner E. Validation of a hand-held point of care device for lactate in adult and pediatric patients using traditional and locally-smoothed median and maximum absolute difference curves. Clin Chim Acta. 2017;468:145-49.