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To study the value of hemodynamic parameters in comparison to lactate values and outcome of illness

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Abstract
A prospective, non-intervention study was undertaken after ethical committee approval in the Department of Surgery, Index Medical College Hospital & Research Centre, Indore.
Persistent higher LACTATE levels in non-survivors in major trauma and sepsis after 48 hours. And gradually decrease level in survivor. Thus, rising serum lactate levels suggest early prediction of shock and mortality. (*p values* less than 0.01).
Rising serum lactate levels predict mortality in trauma and sepsis irrespective of age of patients. Because results are statistically insignificant ($p > 0.01$).
Organ dysfunction suggest higher mortality in trauma and sepsis patients. Statistically significant ($p<0.01$)
Traditional parameters of monitoring no doubt have value in following patient condition; however serial lactate values afford a more objective appraisal. The utility of regular lactate analysis in these patients would depend on factors such as availability and cost of test also. There are no existing studies to support the above premise.

Keywords: Time, Normalization, Lactate & Survival.

Introduction
Historically, hemodynamics refers to a set of parameters that define cardiovascular function and blood flow through the circulation. Classically, these are markers of the macrocirculation, such as cardiac output, mean arterial pressure, mixed venous oxygen saturation, and indices of preload, such as central venous pressure. In the setting of critical illness, improving pathological values is likely beneficial and are common targets for the practicing clinician. However, there is increasing evidence suggesting traditional hemodynamic parameters are unreliable [1], and the ability to apply a set of hemodynamic norms across individual patients with differing physiology can be inappropriate [2]. Also, normalization of hemodynamics often leaves a significant proportion of patients with ongoing tissue hypoperfusion [3].

Material & Method
From July 2017 to June 2018, a prospective, non-intervention study was undertaken after ethical committee approval in the Department of Surgery, Index Medical College Hospital & Research Centre, Indore. A total of 50 patients were included into study.

Inclusion and Exclusion Criteria
- The study included the following patients, in the age group of 5-60 yrs in ICU or ward:
  - Patients admitted within 12 hrs of trauma including road accidents, burns, rail-road accidents, fall from height and assault etc;
  - Patients of suspected or overt sepsis including those criteria for SIRS, septic shock and MODS.
- Patients with the following positive history were excluded from the study:
  - Co morbidities – Bronchial asthma, DM, IHD, CHF, renal failure, renal transplant, malignancy, chronic pancreatitis.
  - History of acute alcohol ingestion, ingestion of poison.
  - Chronic medication for diabetes, asthma, tuberculosis, iron supplementation, epilepsy, AIDS.
  - Known Inborn Error of Lactate Metabolism.

The patients were admitted and treated as deemed necessary under different surgical units.

Data Collection

The following data was collected:

- Hospital registration number.
- Date and time of injury/inclusion into study.
- Vitals on admission and at regular intervals, with records of urine output, oxygen saturation, and CVP, as and when available.
- Blood lactate levels at admission, 12hrs, 24hrs, 48hrs.
- Initial work-up: Hb, PCV, T & D, WBC counts, random blood sugar, s. electrolytes: arterial blood gases(as per discretion of treating doctor)
- Documentation of organ dysfunction with s. creatinine, s. bilirubin, platelet count, chest x-ray, arterial blood gases (where available).
- Outcome was recorded as survival or non-survival.
- A record of no. of days of hospital stay was also kept after inclusion into the study.

Treatment was left to the discretion of the attending consultant. Finally, records were also kept of the types of organ dysfunction and certain intervention including ventilator support, dialysis and surgery.

Sample Collection

Samples for analysis of blood lactate levels were collected at admission, 12 hrs, 24 hrs, and 48 hrs. 5 ml of heparinized venous blood was collected without stasis in vacuum containers with fluoride as reagent (to inhibit glycolysis) and transported to the laboratory for analysis. Storage, if necessary, was done in closed container at 4-6 degree centigrade.

Results

Table 1: Lactate Levels

Lactate Levels		Group	N	Mean	SD	p- value
Sepsis	0 hrs	Died	9	38.77	16.54	0.606
		Survived	12	35.44	12.60	
	12 hrs	Died	9	54.68	19.96	<0.01
		Survived	12	27.01	11.48	
	24 hrs	Died	9	51.81	20.20	<0.01
		Survived	12	19.08	5.88	
	48 hrs	Died	9	45.78	15.42	<0.01
		Survived	12	11.80	2.86	
Trauma	0 hrs	Died	5	35.58	22.39	0.143
		Survived	24	26.73	8.93	
	12 hrs	Died	5	50.48	16.59	<0.01
		Survived	24	22.91	11.59	
	24 hrs	Died	5	58.22	14.12	<0.01
		Survived	24	16.05	8.13	
	48 hrs	Died	5	51.36	13.27	<0.01
		Survived	24	12.35	9.11	

Above table suggest that persistent higher LACTATE levels in non-survivors in major trauma and sepsis after 48 hours. And gradually decrease level in survivor. Thus, rising serum lactate levels suggest early prediction of shock and mortality. (*p values* less than 0.01)

Table 2: Lactate Levels

Lactate Levels	Sepsis		Trauma	
	Died	Survived	Died	Survived
</= 20	1	0	1	6
	100.0%	0.0%	14.3%	85.7%
21-40	3	9	2	16
	25.0%	75.0%	11.1%	88.9%
> 40	5	3	2	2
	62.5%	37.5%	50.0%	50.0%
Total	9	12	5	24
	42.9%	57.1%	17.2%	82.8%
p- value	0.125		0.17	

Above table suggest that rising serum lactate levels predict mortality in trauma and sepsis irrespective of age of patients. Because results are statistically insignificant ($p > 0.01$).

Table 3: Organ Dysfunction

Organ Dysfunction	Sepsis		Trauma	
	Died	Survived	Died	Survived
No	0	10	0	18
	0.0%	100.0%	0.0%	100.0%
Yes	9	2	5	6
	81.8%	18.2%	45.5%	54.5%
Total	9	12	5	24
	42.9%	57.1%	17.2%	82.8%
p- value	<0.01		<0.01	

Organ dysfunction suggest higher mortality in trauma and sepsis patients. statistically significant($p<0.01$)

Discussion

Optimization of hemodynamic parameters, as judged by non invasive and also invasive monitoring available may leave a considerable number of patients in compensated shock. Global hypoxia, when allowed to persist, leads to organ dysfunction and death. The lactate level in blood has been known to be a marker of hypoxia. This study was undertaken to see the utility of serial blood lactate as a predictor of shock in our setup in critical patients [4, 5].

To conclude, serial lactate levels can be used to predict a grave outcome in patients of trauma or sepsis. However, it would be wise to state that the process of recovery from such an insult is a very long one. It can be likened to the war of Troy where many battles were won and lost before the final outcome of the war was declared to the world! Lactate values probably need to be followed for longer periods of time in critical patients even when they have tided over the present crisis [6&7].

The utility of regular lactate analysis in these patients would depend on factors such as availability and cost of tests as well. There are no existing studies to support the above premise [8].

Conclusion

Traditional parameters of monitoring no doubt have value in following patient condition; however serial lactate values afford a more objective appraisal. The utility of regular lactate analysis in these patients would depend on factors such as availability and cost of test also. There are no existing studies to support the above premise.

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