Determination of plasma lactate in the emergency department for the early detection of tissue hypoperfusion in septic patients

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Introduction:

- Sepsis is one of the major health problems.
- The rapidity with which the initial managment is established is determinant in the morbi-mortality in the short, medium and long term.

Objective:

- The study seeks to know if the measurment of plasma lactate can be used as a prognostic marker of complications in septic patients admitted to an emergency department

Materials and method:

- It was an observational study carried out in the period from May to September 2013 in the Emergency Service of the Regional General Hospital No.46 of the Mexican Institute of Social Security.
- **Inclusion criteria:** patients older than 18 years with at least two signs of systemic inflammatory response (SIRS) (table1).
- **Non-inclusion criteria:** patients presenting with chronic renal failure, hepatic failure and on biguanide therapy,
- **Exclusion criteria:** patients with a diagnosis of severe sepsis or septic shock

Table 1
Diagnostic criteria for sepsis.

Documented or suspected infection, and some of the following:
General variables
Fever (>38.3 °C)
Hypothermia <36 °C)
Heart rate > 90 beats per min, or more than two SDs above normal for age.
Tachypnea
Altered mental state
Significant edema or a positive fluid balance (>20 mL/kg in 24 h)
Hyperglycemia (plasma glucose > 140 mg/dL) in the absence of diabetes
Inflammatory variables
Leukocytosis (leukocyte count > 12,000)
Leukopenia (leukocyte count <4000)
Normal leukocytes with >10% immature forms

Abbreviations: SD, standard deviation; °C, degrees centigrade; ml, milliliters; kg, kilograms; mg, milligrams; dl, deciliter.

- Patients were followed up for 7 days.
- Possible complications were ICU admission, death and progression to severe sepsis or septic-shoc.
- 98 patients were included in this study.

Results:

Table 2
Clinical and demographic characteristics of patients

Variable	Values
Age[a]	59 (± 20.31)
Sex[b]	
Men	54 (49)
Women	46 (41)
Comorbidities[b]	
Systemic arterial hypertension	41 (37)
Diabetes mellitus type 2	30 (27)
Clinical features[a]	
Systolic blood pressure (mm Hg)	114 (± 20.73)
Diastolic blood pressure (mm Hg)	70 (± 11.93)
Mean blood pressure (mm Hg)	86 (± 13.73)
Heart rate (bpm)	103 (± 16.39)
Respiratory rate (bpm)	23 (± 5.66)
Significant edema[b]	27 (30)
Temperature (°C)	36 (± 0.94)
Oxygen saturation by pulse oximetry (%)	95 (± 5.98)
Glasgow Coma Scale (score)	15 (± 2.83)
Laboratory studies[a]	
Plasma lactate (mmol/L)	1.4 (±2.32)

Abbreviations: mmol/L, millimoles per liter; mmHg, millimeters of mercury; bpm, breaths per minute; bpm, beats per minute; °C, degrees Celsius.

[a] Median and standard deviation.

[b] Percentage.

- It was observed that 25% of the patients showed complications.

- Lactate levels were significantly higher in patients with complications than in the uncomplicated group

- The ROC curve set at 0.72 determines a plasma lactate value of 4.2 mmol/L as the cutoff point that best describes the likelihood of complications.

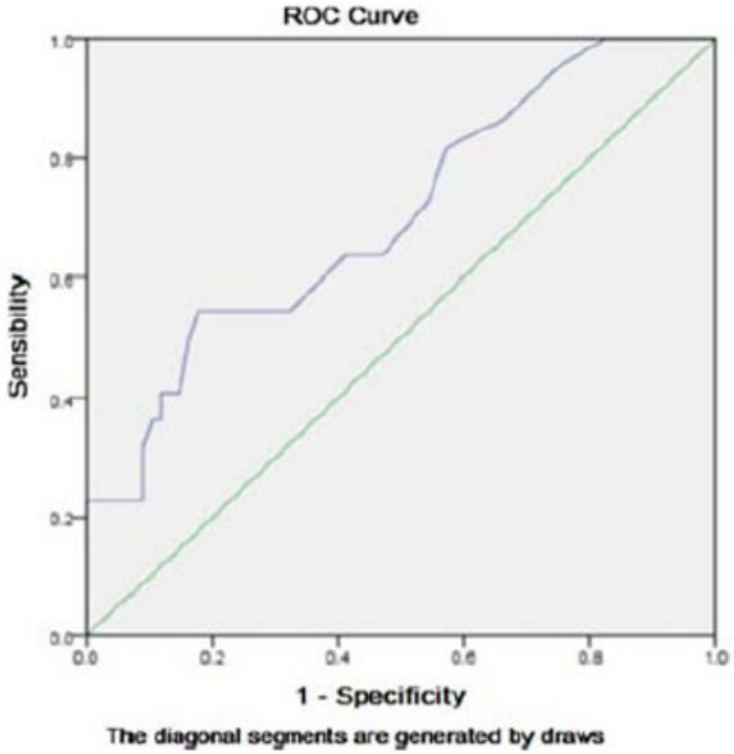

Fig. 1. ROC curve for lactate value (mmol/L) as predictor of complications in septic patients.

Table 3

Predictive ability of plasma lactate complications.

Values	Lactate ≥4.20 mmol/L	Lower limit	Upper limit
Prevalence of complications	24.44%	16.26%	34.84%
Patients correctly diagnosed	76.67%	66.35%	84.67%
Sensitivity	22.73%	8.69%	45.82%
Specificity	94.12%	84.86%	98.10%
Positive predictive value	55.56%	22.65%	84.66%
Negative predictive value	79.01%	68.26%	86.96%
Positive probability ratio	3.86	1.14	13.14
Negative probability ratio	0.82	0.65	1.04

Abbreviations: mmol/L, millimoles per liter.

Discussion:

- The cutoff point stipulated in 4.2mmol/L, plasma lactate shows a non-significant sensitivity, however, its predictive value lies in its high specifity, qualifying it with a high potential to detect those patients with a diagnostic test < 4.2 mmol/L and low probability of complications.

Conclusion:

- The results support serum lactate as a useful risk stratificaion tool for decision making in emergency department.