MONITORING OF LACTATE AS A NEGATIVE PROGNOSTIC INDICATOR IN PATIENTS IN INTENSIVE CARE

GIUSEPPA LA CAMERA, *GIOVANNI CANTARELLA, DANILO CARMELO GRASSO, DARIO AKHSHIK, CHRISTIAN BONSIGNORE, SOFIA PITINO, ALESSANDRO GAROFALO, PIERFILIPPO DI MARCO
*Department of Medical and Pediatric Sciences-Section Cardiology; Department of Medical Surgical Specialties-Section Anaesthesia and Intensive Care, University of Catania, Italy

ABSTRACT

An evaluation of the significance of blood concentration of lactate as a negative prognostic indicator in critical post-operative patients in intensive care ad exitus

***Key words**: Intensive care, lactic acidosis, blood-gas analysis.*

***Received** February 18, 2014; **Accepted** March 24, 2014*

Introduction

Lactates, the ionic form of lactic acid, are products of muscular cells, red blood cells, the brain, and other tissues during anaerobic metabolism. Values higher than 2mmol/L[1,2] are considered hyperlactatemia, and are found in injured tissue due to a modification in the ratio between supply and demand of O2. When that condition is combined with a decrease in pH, it is considered lactic acidosis. Such conditions may result from various pathologies that increase the production of lactate in the blood (renal or liver diseases), or insufficient pulmonary respiration or hypo-perfusion (trauma, hemorrhage, cardiac insufficiency, pulmonary edema), each of which are very common in patients hospitalized in intensive care[3]. We evaluated the correlation between blood concentration of lactate and the worsening clinical condition of patients in intensive care ad exitus as a possible negative prognostic indicator.

Materials and methods

This study examined 11 non-septic patients (4 male, 7 female, age 25-85 years) ad exitus, after major abdominal surgery, in the ICU of the Polyclinic Hospital of Catania, Italy, hospitalized between January and October 2013. All patients underwent arterial blood draws for blood/gas-analysis and lactatemia at the following times:

- T0: admission to ICU
- T1: 24h after admission
- T2: 48h before exitus
- T3: 24h before exitus
- T4: immediately before exitus

The arterial blood/gas-analysis (ABG) and determination of blood concentration of lactate were performed by means of a GEMPremier4000 blood/gas analyzer and cartridge (Instrumentation Laboratory).

Results

The average values were calculated statistically for the different times (T0-T4). As illustrated in Figure 1, at admission (T0) the average value was 2.1mmol/L, with 54.5% of patients hyperlactatemic. At T1 there was a slight decrease in lactate, with an average concentration of 1.2mmol/L, and 27.2% of patients hyperlactatemic.

In contrast, at T2 and T3 (48h and 24h from exitus), there was a gradual increase of lactate, with an average of 3.3mmol/L and 4.1mmol/L respectively, in 72.7% and 90.9% of patients respectively. At exitus the value peaked at 5.2mmol/L, with 100% of patients hyperlactatemic (Figure 2).

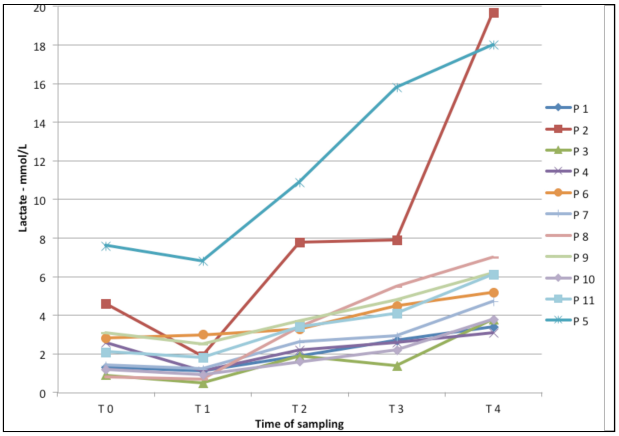

Figure 1: Blood concentration of lactate at times: T0,T1,T2,T3,T4.

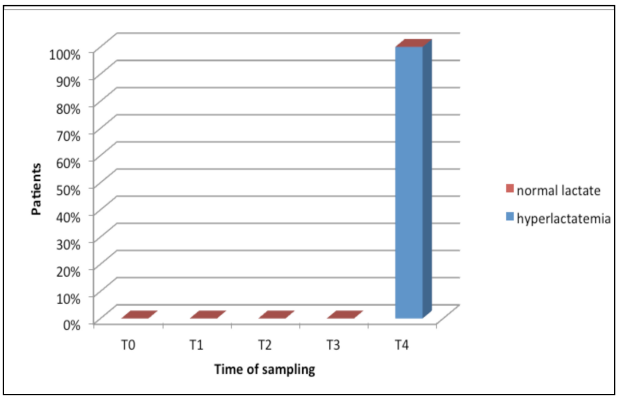

Figure 2: Percentage of variation in patients with hyperlactatemia at the times measured.

Discussion

Analysis of the data show that the variation in blood concentration of lactate from admission to exitus in the ICU patients was a uniform progression. On admission only about half of the patients had lactate values above normal (>2mmol/L), which is highly significant compared to the percentage of patients with hyperlactatemia ad exitus (100%). The day after admission there was a slight decrease in the average lactate values, probably due to the beginning of treatment[4]. The average values increased thereafter, along with the worsening of the patient's clinical condition. Hence, the increase in lactate values correlated with the worsening prognosis, regardless of the individual pathology, and so represents a significant negative prognostic indicator in critical patients, with high sensitivity but low specificity[5,6].

Conclusion

The routine measurement of lactate values may be an aid to evaluate the changing prognosis of patients in intensive care, offering early identification of patients who need greater care, and may thereby guide therapeutic decisions and resources.

References

1) Rishu AH, Khan R, Al-Dorzi H, Tamim HM, Al-Qahtani-"*Even Mild Hyperlactatemia is Associated with Increased Mortality in Critically Ill Patients*" Critical care 2013.
2) Kenrick Berend, Willem Develter "*Admission hyperlactatemia in intensive care units and mortality*" Journal of Critical Care June 2011; *321-322*.
3) DU W, Liu DW, Shi Y, Long Y, Rui X, Wang XT *"Relationship of hyperlactatemia and metabolic acidosis"* Zhonghua Yi Xue Za Zhi. 2011 Sep 6; 91(33): *2324-8*.
4) Jansen TC, van Bommel J, Schoonderbeek FJ, et al. *"Early lactate-guided therapy in intensive care unit patients a multicenter, open-label, randomized controlled trial"* Am J Respir Crit Care Med. 2010; 182: *752-61*.
5) Serena Greco, Giovanna Guiotto, Antonino Maffei, Stefania Martino, Giuseppe Romano, Fernando Schiraldi "*La clearance del lattato nelle emergenzecardiorespiratorie*". Emergency care Journal Agosto 2007
6) del Portal DA, Shofer F, Mikkelsen ME, Dorsey PJ Jr, Gaieski DF, Goyal M, Synnestvedt M, Weiner MG, Pines JM. *"Emergency department lactate is associated with mortality in older adults admitted with and without infections"* Acad Emerg Med. 2010 Mar;17(3):260-8. doi: 10.1111/j.1553-2712.2010.00681.x.

Request reprints from:
PIERFILIPPO DI MARCO
Catania
(Italy)