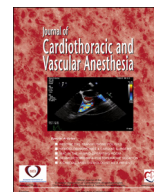




Contents lists available at ScienceDirect

ScienceDirect

journal homepage: www.jcvaonline.com

Original Article

Prognostic Value of Hyperlactatemia and Lactate Clearance After Mitral Valve Surgery

Adam S. Evans, MD^{*,†}, Matthew A. Levin, MD^{†,‡},
 Hung-Mo Lin, ScD[§], Ken Lee, BS[¶], Menachem M. Weiner, MD[†],
 Anelechi Anyanwu, MD^{*}, David H. Adams, MD^{*},
 Alexander J.C. Mittnacht, MD^{†,1}

^{*}Department of Cardiothoracic Surgery, The Icahn School of Medicine at Mount Sinai, New York, NY

[†]Department of Anesthesiology, The Icahn School of Medicine at Mount Sinai, New York, NY

[‡]Department of Genomics and Genetics Sciences, The Icahn School of Medicine at Mount Sinai, New York, NY

[§]Department of Population Health Science and Policy, The Icahn School of Medicine at Mount Sinai, New York, NY

[¶]Chicago Medical School at Rosalind Franklin University, Chicago, IL

Objectives: Blood lactate is frequently used to guide management in critically ill patients. In patients undergoing mitral valve surgery, an elevated lactate level is frequently observed; however, overall mortality is low. The authors hypothesized that hyperlactatemia is not a useful predictor of poor outcomes in this patient population. The main aim of this study was to explore how blood lactate level and lactate clearance are associated with 30-day mortality and major adverse events in patients undergoing mitral valve surgery.

Design: This was a retrospective database review. Logistic regression analysis was performed to assess the associations of perioperative factors with blood lactate in the intensive care unit (ICU).

Setting: Tertiary-care teaching hospital.

Participants: The study comprised 917 patients undergoing mitral valve surgery.

Interventions: None.

Measurements and Main Results: The majority of patients (71.8%) had elevated blood lactate ≥ 2 mmol/L on ICU admission; however, within 24 hours, 85.1% of all patients had normal lactate values. Overall 30-day mortality was 2.29% ($n = 21$). The combination of lactate ≥ 7 mmol/L on ICU admission and a persistent elevated blood lactate level 24 hours after ICU admission provides an excellent prediction of 30-day mortality (C statistic = 0.85). However, even a significantly elevated lactate level on ICU admission was well-tolerated in the majority of patients as long as lactate values normalized within 24 hours. Male sex, longer cardiopulmonary bypass time, blood transfusion in the ICU, and an elevated blood lactate level on ICU admission and 12 hours after ICU admission all were independent risk factors of clearance failure.

A.S. Evans and M.A. Levin contributed equally to this work.

K. Lee received a grant from the Foundation for Anesthesia Education and Research for a summer medical student internship. D.H. Adams receives royalty payments from Edwards Lifesciences (Irvine, CA) and Medtronic (Minneapolis, MN) and is the National Co-Principal Investigator of the CoreValve United States Pivotal Trial (supported by Medtronic); the NeoChord DS1000 System Pilot Study (supported by NeoChord, Inc, St Louis Park, MN); and the Twelve Intrepid TMVR Pilot Study (supported by Medtronic). None of the sponsoring organizations had any role in the design or conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; or decision to submit the manuscript for publication.

¹Address reprint requests to Alexander J.C. Mittnacht, MD, The Mount Sinai Medical Center, Box 1010, One Gustave L. Levy Place, New York, NY 10029.

E-mail address: alexander.mittnacht@mounsinai.org (A.J.C. Mittnacht).

<http://dx.doi.org/10.1053/j.jvca.2017.08.002>

1053-0770/© 2017 Elsevier Inc. All rights reserved.

Conclusions: An elevated blood lactate level is common after mitral valve surgery and is well-tolerated in the majority of patients. Adding lactate clearance improved the predictive value of the blood lactate level.

© 2017 Elsevier Inc. All rights reserved.

Key Words: critically ill; heart surgery; blood lactate; lactate clearance; cardiopulmonary bypass; postoperative care

AN ELEVATED BLOOD lactate level has been associated with poor outcome in many clinical settings, including cardiac surgery.¹⁻³ Blood lactate also is frequently used to guide interventions such as fluid administration or inotrope therapy,^{4,5} and failure to clear lactate may be a reason for prolonged mechanical ventilation and intensive care unit (ICU) length of stay. Recently, dynamic lactate parameters such as the rate of lactate rise and lactate clearance have been suggested as predictors of mortality.⁶⁻⁸ The authors frequently observe hyperlactemia after mitral valve surgery; however, overall mortality remains low.^{9,10} Our hypothesis was that static blood lactate after surgery is not a useful predictor of mortality and major adverse events (MAE) and that adding a dynamic parameter such as lactate clearance may confer benefits in identifying patients who require more intense interventions.

Materials and Methods

Data Collection

Institutional Review Board approval and waiver of informed consent were obtained before the study was begun. Data were collected retrospectively on all adult (age > 18 yr) patients primarily undergoing mitral valve surgery at the authors' institution between January 1, 2012, and December 31, 2013. Additional procedures performed were not considered to be exclusion criteria, and this was considered in the data analysis. Strengthening the Reporting of Observational Studies in Epidemiology guidelines for reporting observational studies were followed.¹¹ The initial query used the Current Procedural Terminology codes for mitral valve surgery (ie, 33420-33429, 33430-33439). This initial list was verified against the Society of Thoracic Surgeons (STS) case classification assignment (case ascertainment). Patient characteristics and perioperative data were obtained from the authors' anesthesia information management system and institutional data warehouse and by performing a manual chart review of the electronic medical record (Epic; Epic Systems Corporation, Verona, WI).

Mortality was defined as 30-day mortality, and MAE were defined as follows: renal failure (increase of creatinine to ≥ 4.0 with an increase of at least 0.5 mg/dL or 3 times the preoperative creatinine level, as per the risk, injury, failure, loss, and end-stage kidney failure (RIFLE) criteria¹²) or need for dialysis; stroke (new onset neurologic deficits lasting > 24 h); and prolonged mechanical ventilation (> 24 h after ICU admission).

Blood Lactate Parameters

All patients' blood lactate level was measured routinely at the time of ICU admission. At minimum, a 2-hour time interval between repeated measures was considered standard practice, and more frequent analyses were obtained if clinically indicated. Only arterial blood lactate was used. Blood lactate was analyzed as part of the arterial blood gas analysis panel (GEM Premier 3000 blood gas analyzer; Instrumentation Laboratory, Bedford, MA). *Hyperlactemia was defined as blood lactate ≥ 2 mmol/L.*¹³ Several dynamic lactate parameters were investigated: Lactate clearance defined as failure to reach a lactate level < 2 mmol/L 24 hours after ICU admission, rate of lactate rise and decline as the respective slopes associated with the first maximum lactate value in the ICU, and the time-weighted average lactate defined as the area under the curve over various time intervals standardized by the total length of observation period.

Use of inotropes/vasopressors was modeled using an inotrope score described by Gaies et al¹⁴ and was examined individually. Briefly, the inotrope score was calculated by taking the sum of all inotrope/vasoactive drug doses, with each drug weighted by an equivalency factor (dobutamine $\times 1$, milrinone $\times 10$, epinephrine/norepinephrine $\times 100$, vasopressin $\times 1,000$).

Clinical Management

General anesthesia was induced with etomidate or propofol and was maintained with a volatile anesthetic agent (isoflurane, sevoflurane) throughout the whole procedure, including cardiopulmonary bypass (CPB), and was supplemented with fentanyl and a neuromuscular blocking agent as needed. All surgeries were performed via median sternotomy. CPB with mild hypothermia and antegrade and retrograde cold blood cardioplegia were used for myocardial protection. Flow rates were adjusted to maintain a cardiac index of around 2.4 L/min/m² and a mean arterial blood pressure between 60 and 80 mmHg. Target hematocrit during CPB was > 18%, unless measures of the oxygen supply-demand ratio (ie, mixed venous saturation or cerebral oximetry) suggested a need for higher values. Hemofiltration was performed for the majority of cases during CPB. Separation from CPB was performed in a standard fashion. Intraoperative and postoperative inotropic/vasoactive drugs were administered based on the attending anesthesiologist's preference and guided by hemodynamic monitoring. First-line agents at the authors' institution include epinephrine and norepinephrine. Postoperative care in the ICU included 24-hour continuous coverage by a board-certified intensivist.

Download English Version:

<https://daneshyari.com/en/article/8618386>

Download Persian Version:

<https://daneshyari.com/article/8618386>

[Daneshyari.com](https://daneshyari.com)