Correlation of Initial Serum Lactate and Base Deficit in Cases of Polytrauma: A Retrospective Study

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Abstract: Lactate is the product of anaerobic respiration within the cells. Lactic acidosis is a form of metabolic acidosis. The formation of increased amount of lactic acid in polytrauma patient is mainly due to two reasons as seen in our study hypotension and shock. Since polytrauma is of the Major cause of death all over the world and leads to a number of admission in critical care unit a relation between levels of lactic acid in polytrauma patient will help us better to understand its effect on mortality of patient & hence better management.

Keywords: Lactic Acidosis, Polytrauma, Critical Care, Mortality, Metabolic Acidosis

1. Introduction

Lactic acid measurement in patients with polytrauma can be used as a useful tool if interpreted correctly as it decides the level of H+ in patients blood hence pH (-log(H+)) of patients so the metabolic acidosis(1). By using value of level of lactic acid in patient’s blood we can decide wanted therapy for making condition of the patient better when lactate level is greater than 2 mmol/l it causes hyperlactemia and its level more than 4mmol/l causes lactic acidosis (2, 5).

Causes of Lactic Acidosis in Polytrauma

Increased blood level of lactate in trauma patients is associated with increased mortality. Lactate elevation has been attributed to 1) global hypoperfusion due to hemorrhagic shock,2) regionally due to arteriovenous injury (3).

Mechanism Of Lactic Acidosis In Polytrauma

Hemorrhage → Blood loss → Hypoperfusion → decreased oxygen supply to cell → Anaerobic respiration → increased lactate production

2. Materials and Methods

We have conducted a retrospective study of all polytrauma patients admitted to the Career Institute of Medical Sciences and Hospital, Lucknow between January 2022 to July 2022 for evaluation of lactate level and its correlation to patient condition.

Selection of participants

We have included 100 adult cases aged between 18 years to 60 years with a history of trauma in need to be admitted to critical care unit with injury severity score (ISS) more than 16, serum lactate level More than 2.5mmol/l and base deficit less than or equals to 4 meq and pH less than 7.45 at the initial ABG. In our study patients with a history of coronary artery disease, liver disease, renal disease, malignancy, pregnant females and patients on immunosuppressant drugs have been excluded.

3. Methods Used For Evaluation

Measurement of lactate level was done using Enzymatic Spectrophotometry and ABG (6, 7).

An arterial blood sample was taken. Both methods correlated well when done precisely(4). RBC metabolism continues to generate lactate even when blood is drawn out of the body leading to undesirable lactate elevation. To prevent this blood sample was immediately cooled and the sample was analyzed within 15 minutes of collection.

4. Results

In our study majority of cases are male (72%) and male to female ratio was 2.7:1. Major cause of polytrauma was a road traffic accidents (90%). Only 68 cases survived and 42 cases were not survived. The result is depicted in table 1 and
the relation between base deficit, serum lactate and mortality is given in Tables 2 and 3(1, 2, 8).

**Table 1: Variables Affecting Mortality of Patients**

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Patients</th>
<th>In Hospital Death</th>
<th>Survival To Discharge</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in yrs)</td>
<td>48 (16-60)</td>
<td>55 (50-60)</td>
<td>45 (16-55)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sex (male), (n%)</td>
<td>72</td>
<td>10</td>
<td>62</td>
<td>0.94</td>
</tr>
<tr>
<td>Mechanism of Injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTA</td>
<td>87</td>
<td>29</td>
<td>58</td>
<td>0.002</td>
</tr>
<tr>
<td>Fall</td>
<td>10</td>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Localization of Injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head &amp; Neck</td>
<td>75</td>
<td>40</td>
<td>45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Abdomen</td>
<td>15</td>
<td>1</td>
<td>14</td>
<td>0.44</td>
</tr>
<tr>
<td>Chest</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>0.02</td>
</tr>
<tr>
<td>Extremity</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>0.12</td>
</tr>
</tbody>
</table>

**Table 2: Lactic Acid Levels**

<table>
<thead>
<tr>
<th>Time of lactate levels (in Hrs)</th>
<th>Survivor group mean value (mmol/L)</th>
<th>Non Survivor group mean value (mmol/L)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.6</td>
<td>6.48</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>12</td>
<td>2.4</td>
<td>4.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>48</td>
<td>1.6</td>
<td>4.6</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Table 3: Comparison between Lactate Levels and Base Deficit Levels**

<table>
<thead>
<tr>
<th>Lactate (mol/L)</th>
<th>Base Deficit (mEq/L)</th>
<th>Survivor</th>
<th>Non Survivor</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8</td>
<td>4.65</td>
<td>5.26</td>
<td></td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

found that it can be an important aspect in determining fatality of patients and it’s therapeutic control can save many lives by taking appropriate steps at right time (1, 3, 5, 8).

**References**


5. Discussion

In our study, we found that early normalization of serum lactate and base deficit within 24 hours has a better outcome and that a serum lactate level of more than 4 mmol/l is fatal in most cases.

These two values are crucial indicator for response of patients to resuscitation therapy and also helpful in determining mortality and prognosis of patients.

In our study mortality rate was 42%. Our study showed that both serum lactate level and base deficit at the time of admission were not statically significant with mortality which is accordance with Freitas et al study. Serum lactate and base deficit level at 12 and 24 hour were more important because these levels are higher in non-survivor group in comparison to Survivor group. Early normalization of serum lactic acid and base deficit within 24 hour is associated with better outcome in polytrauma cases (9, 10).

6. Conclusion

So in our study in an attempt to correlate serum lactate level in polytrauma patients to their prognosis and mortality we

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