



COMPARISON OF PERIOPERATIVE SERUM LACTATE LEVEL IN ON-PUMP VERSUS OFF-PUMP CORONARY ARTERY BYPASS GRAFT

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ABSTRACT

Coronary artery bypass grafting (CABG) can be performed with the use of cardiopulmonary bypass (on-pump CABG) or without (off-pump CABG). Lactate is used as a marker for oxygen deficiency in anaerobic metabolism at the tissue level. Increase in tissue lactate concentration is associated with cellular dysfunction due to the depletion of high energy phosphate compounds. This Institution based Retrospective study was done to Compare the peri-operative serum lactate levels in patients undergoing On-pump versus Off-pump CABG Surgery. Total 20 patients were analysed with mean age of 56.35 +- 4.33 years. EURO score-2 shows 0.85 +- 0.28 and 1.21 +- 0.54 in On-pump and Off-pump respectively. EURO score-2 is high in Off-pump when compared with On-pump and this findings are statistically not significant (p: 0.07). Peak lactate levels in On-pump& Off-pump CABG are 4.7& 5.8 mmol/dl respectively. Older studies showed that there was a significant association seen between lactate level and CPB. Off-pump surgery may improve short-term outcomes such as renal failure and stroke. In our study, there were no significant differences in postoperative patterns of release of Lactates in patients with On-pump v/s Off-pump.

KEYWORDS : Coronary Artery Bypass Graft; Serum Lactate; Off pump; On pump

INTRODUCTION

Increase in serum-lactate levels peri-operatively is highly suggestive of tissue ischemia, and is associated with prolonged respiratory and cardiovascular support.[1]

Coronary artery bypass grafting (CABG) can be performed with the use of cardiopulmonary bypass (onpump CABG) or without (off-pump CABG). Studies comparing on- to off-pump CABG have consistently reported longer postoperative mechanical ventilation time and longer ICU- and hospital length of stay in the on-pump group, possibly explained by aortic manipulation and cardiopulmonary bypass (CPB)-triggered pro-inflammatory response which increased the risk of myocardial damage, adverse neurologic events and renal injury [2]

Lactate is used as a marker for oxygen deficiency in anaerobic metabolism at the tissue level. Increase in tissue lactate concentration is associated with cellular dysfunction due to the depletion of high energy phosphate compounds.[1] Lactate is produced by erythrocytes, peri venous hepatocytes, skeletal muscle myocytes, and skin and is cleansed by the liver and kidneys. Elevated blood lactate levels indicate increased lactate production, decreased lactate clearance, or both occurring simultaneously.[2] Systemic hypo perfusion, hemodilution, and tissue hypoxia are believed to increase lactate levels in patients undergoing cardiopulmonary bypass (CPB).[3]

Hypo perfusion and hypothermia during coronary artery bypass graft (CABG) surgery decreased liver function and therefore most of the patients exhibit a progressive increase in plasma lactate during cardiopulmonary bypass (CPB).[4]

Several studies have shown the utility of lactate level as a predictor of unfavourable outcome.

MATERIALS AND METHODS

- To Compare the peri-operative serum lactate levels in patients undergoing On-pump versus Off-pump CABG Surgery.
- Type of study : Institution based Retrospective study (April

2022 to Dec 2022)

- Sample size : 20 CABG Pts (On pump CABG-15 & Off Pump CABG- 15)
- Study population and study area: 50 to 65 years old patients who underwent CABG Surgery in RVM Institute of Medical Sciences and Research Center in Siddipet dist. Telangana state.

Inclusion :

CABG Patients with LVEF:>35%, EUROscore-2 :<1.5%, Normal LFT, BMI :<30Kg/m2,

Exclusion :

Baseline lactate: □2mmol/dl, Pre-op S Cr: □1.2mg/dl, DM with HbA1C > 7.

Institutional Ethical Committee and Scientific committee approval taken.

Data collection : Departmental Electronic Medical records. Statistical analysis: SPSS version 26.

Mean, Standard Deviation, Chi square test and Student t-test were used for statistical analysis with p < 0.05 was considered as statistically significant.

OBSERVATIONS AND RESULTS

Study tool: Semi structured tool consisting of demographic details, BMI, EUROscore2, LVEF, CPB duration, Aorta cross clamp time, hemodynamic parameters, SaO2, Lactate levels.

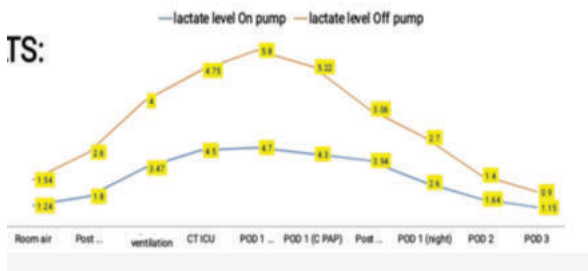


Figure 1 – Comparison of lactate levels between groups

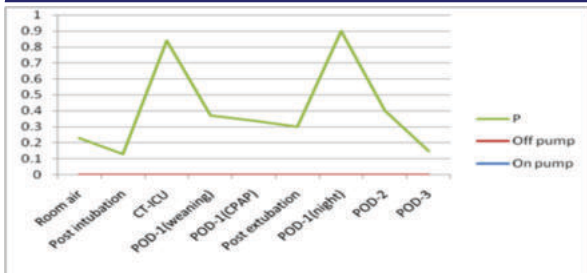


Figure 2 – Comparison of lactate levels within groups

| Parameters | MAP | | | CVP | | | SaO2 | | | Serum Lactate levels | | |
|-----------------|-----------|-----------|------|---------|---------|-------|----------|-----------|-------|----------------------|----------|------|
| | On pump | Off pump | P | On pump | Off | P | On pump | Off pump | P | On pump | Off pump | P |
| Room air | 91.3±11.4 | 94.1±9.56 | 0.56 | 5.5±2.0 | 5.9±0.8 | 0.57 | 97.5±2 | 97.7±1.8 | 0.87 | 1.2±0.3 | 1.5±0.6 | 0.23 |
| Post intubation | 86.4±16.7 | 93.9±4.9 | 0.19 | 6.7±1.5 | 6.2±1.1 | 0.42 | 99.6±0.2 | 98.6±1 | 0.009 | 1.8±0.6 | 2.6±1.3 | 0.13 |
| CT-ICU | 86.5±8.8 | 86.5±10.0 | 1 | 6.9±1.1 | 6.5±1.3 | 0.47 | 99.2±0.6 | 98.07±0.8 | 0.004 | 4.5±1.4 | 4.7±2.0 | 0.84 |
| POD-1 (weaning) | 86.1±13.9 | 84.5±9.6 | 0.76 | 6.3±1.1 | 5.6±1.0 | 0.17 | 98.7±0.9 | 98.4±1.0 | 0.47 | 4.7±1.8 | 5.8±3.3 | 0.37 |
| POD-1 (CPAP) | 86.0±12.3 | 81.1±9.4 | 0.33 | 6.2±1.1 | 5.8±1.5 | 0.51 | 98.9±0.9 | 98.5±1.0 | 0.37 | 4.3±2.1 | 5.2±3.1 | 0.34 |
| Post extubation | 88.2±7.2 | 80.8±11.4 | 0.10 | 6.5±1.2 | 5.3±59 | 0.02 | 99.1±0.4 | 98.11±0.7 | 0.001 | 3.9±2.0 | 3.0±1.5 | 0.30 |
| POD-1 (night) | 91.5±5.6 | 83.2±10.2 | 0.03 | 6.7±0.6 | 5.2±1.2 | 0.00 | 98.9±0.7 | 98.1±1.3 | 0.12 | 2.6±1.6 | 2.7±1.3 | 0.90 |
| POD-2 | 91.7±8.6 | 85.1±12.3 | 0.18 | 6.8±1.5 | 5.6±1.1 | 0.06 | 98.9±0.4 | 98.3±0.8 | 0.07 | 1.6±0.5 | 1.4±0.6 | 0.40 |
| POD-3 | 88.8±11.1 | 86.8±6.4 | 0.62 | 6.8±1.3 | 5.2±0.7 | 0.004 | 98.6±1.0 | 98.1±1.0 | 0.29 | 1.1±0.4 | 0.9±0.3 | 0.15 |

DISCUSSION

Jabbari.A.et.al., study there was a significant association seen between lactate level and CPB time(p=0.03). In our study, Peak Lactate levels were high among Off-pump CABG patients= when compared to On-pump CABG patients, but it is statistically not significant (p = 0.134)

Peak values noted 6-8 hrs post operatively in both the groups. (On&Off Pump CABG).

Alina zubarevich et al., EuroScore II Class was significantly higher in the OPCAB group 1.90 (IQR, 1.40–2.50) vs. on-pump group 1.30 (IQR, 0.90–2.20) (P=0.0003),[5] in our study EURO score-2 is high in Off-pump when compared with On-pump and this findings are statistically not significant (p:0.07).

Manjiri Warang Msc et al.,The off pump group showed better postoperative renal function, and less incidence of lactic acidosis and oxidative stress than the cardiopulmonary bypass group , The off pump technique is associated with reduced myocardial injury, inflammatory response, and postoperative morbidity [6]. . In our study, Peak Lactate levels were high among Off-pump CABG patients when compared to On-pump CABG patients, but it is statistically not significant (p = 0.134) Peak values noted 6-8 hrs post operatively in both the groups.(On&Off Pump CABG).

Adams et al.,Based on their analysis of 102 randomized trials, they concluded that off-pump surgery may improve short-term outcomes such as renal failure and stroke, but “off-pump may be associated with reduced graft patency, and increased risk of cardiac reintervention and death.” The paucity of long-term data contributed to uncertainty over whether late outcomes differed significantly after on-pump versus off-pump surgery [7] In our study, There were no significant differences in postoperative patterns of release of Lactates in patients with On-pump v/s Off-pump,As the sample size is small, the findings of the study needs to be further evaluated in a larger sample including some more relevant variables.

Nasrin aktar et al., The findings of this study permits to conclude that blood lactate level 6hours after ICU transfer is associated with an increased risk of postoperative early

Following table showing correlation between the findings in on pump and off pump with perioperative parameters

Total 20 patients were analysed with mean age of 56.35 +- 4.33 years. EURO score-2 shows 0.85 +- 0.28 and 1.21 +- 0.54 in On-pump and Off-pump respectively.

EURO score-2 is high in Off-pump when compared with On-pump and this findings are statistically not significant (p: 0.07). Peak lactate levels in On-pump& Off-pump CABG are 4.7& 5.8 mmol/dl respectively.

adverse outcome after off-pump coronary artery bypass grafting. It is found that lactate is an independent predictor of major postoperative complications. So, achieving normal blood lactate level following OPCABG is essential for minimizing postoperative adverse outcome.[8]

Mehdi Hasanpour et al., Most of patients were male (86.7%). The mean age of patients was 58.1 years. The blood lactate and VO2/VCO2 values increased after surgery. There was no statistically significant difference in two groups based on number of grafts and serum Cr but it was statistically significant based on E/F [9]

CONCLUSION

There were no significant differences in postoperative patterns of release of Lactates in patients with On-pump v/s Off-pump. As the sample size is small, the findings of the study needs to be further evaluated in a larger sample including some more relevant variables.

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