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Predictive value of venous-to-arterial carbon dioxide tension difference, lactate and central venous oxygen saturation after aortic surgery with hypothermic circulatory arrest

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Objective:
Since normal or high central venous oxygen saturation (ScvO2) values cannot discriminate if tissue perfusion is adequate, integrating other markers of tissue hypoxia, such as central venous-to-arterial carbon dioxide difference (Δ pCO2) has been proposed in patients after non-cardiac surgery. It was the aim of the present study to investigate the prognostic significance of serum lactate, Δ pCO2 and ScvO2 in patients after thoracic aortic surgery (TAS) with moderate hypothermic circulatory arrest (MHCA).

Methods:
102 consecutive patients undergoing TAS with MHCA were prospectively enrolled. Measurements of serum lactate, Δ pCO2 and ScvO2 in the blood were performed on admission and 6 hours after admission on ICU. Primary endpoint was 30-d-mortality; secondary outcomes included LCOS. and MACCE (LCOS, Stroke, CPR, myocardial infarction).

Results:
Mean age of patients was 69.1±10.9 years, 35 patients were female (34%). Non survivors were significantly older, had a higher Euro-Score and longer duration of cardiopulmonary bypass, aortic cross clamp time and cardiac arrest time.

Non-Survivors were characterized by significantly higher lactate levels on admission and 6 hours after admission (initial: 7.5 ± 5.3 vs. 2.4 ± 2.2 mg/dl, p < 0.01, 6-h: 6.0 ± 4.4 vs.1.9 ± 1.7 mg/dl). In contrast, Δ pCO2 (initial: 6.6 ± 5.1 vs. 8.5 ± 3.6 mmHg, p = n.s.; 6-h: 7.1 ±4.7 vs. 7.9 ± 54.1, p = n.s.) and ScvO2 (initial: 73.5 ± 12.2 vs. 74.2 ± 15.5 %, p = n.s.; 6-h: 71.3 ± 12.7 vs. 76.4 ± 16.8 %, p = n.s.) did not differ between survivors and non-survivors.

Early lactate levels after admission were able to predict postoperative LCOS (AUC 0.871, p < 0.001), MACCE (AUC 0.879, p < 0.001) as well as mortality (AUC 0.867, p < 0.001). In contrast, Δ pCO2 and ScvO2 showed a low predictive capacity for postoperative outcome. In the subgroup of patients with normal lactate and ScvO2 values, Δ pCO2 was also not associated with early postoperative morbidity or mortality.



102 Patients undergoing TAS with MHCA



	Survivor	Non Survivor	
Lactate	2.4 ± 2.2 mg/dl	7.5 ± 5.3 mg/dl	p < 0.01
Δ pCO2	8.5 ± 3.6 mmHg	6.6 ± 5.1 mmHg	p = n.s
ScvO2	74.2 ± 15.5 %	73.5 ± 12.2%	P = n.s.

Conclusion:
Early postoperative lactate levels can identify patients with high risk for morbidity and mortality after TAS with MHCA. In contrast to patients undergoing non-cardiac surgery, Δ pCO2 is **not** predictive of postoperative complications or mortality.