

Abstract

Cardiopulmonary Bypass Cooling Strategies During Circulatory Arrest and Renal Consequences - A National Registry Study

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Background

Cardiac surgery associated acute kidney injury (CSA-AKI) is a common complication after cardiac surgery, associated with prolonged ICU stay, increased morbidity and mortality. In thoracic aortic aneurysm surgery, circulatory arrest is required, which may affect kidney function. Contemporary cardiothoracic surgery has increasingly moved toward moderate and mild hypothermia. Hypothermia is used to lower the metabolism and thereby increase the tolerance for ischemia. An important question is how milder hypothermic strategies affect postoperative renal outcomes

Methods

In this national registry study, 608 patients were included. Inclusion criteria were thoracic aortic aneurysm (TAA) surgery hypothermic circulatory arrest. According to current guidelines, patients were categorized into four hypothermia groups, deep hypothermia (DHT) $<20^{\circ}\text{C}$, low moderate hypothermia (LMHT) $20.1-24^{\circ}\text{C}$, high moderate hypothermia (HMHT) $24.1-28^{\circ}\text{C}$ and mild hypothermia (MHT), $>28^{\circ}\text{C}$. AKI was classified using modified KDIGO (stages 1-3). Statistics included Mann Whitney U test, Kruskal-Wallis, Chi square and multivariable logistic regression tests.

Results

AKI was detected in 162 patients (27%) along with difference in AKI between the hypothermia groups ($p=0.009$). The multivariable logistic regression analysis showed that LMHT, OR 2.08, CI 1.09-3.95 ($p=0.026$) and HMHT OR 2.83 CI 1.54-5.17 ($p<0.001$) was associated with a higher risk of AKI compared to DHT, MHT OR 2.11 CI 0.89-4.99 ($p=0.09$). Unadjusted, 30 day and one year mortality were more prominent in the AKI vs No AKI group, 9.3% and 0.4%, ($p<0.001$), 12.3% and 4%, ($p<0.001$), respectively.

Conclusion

Deep hypothermia may be associated with lower incidence of AKI compared to other hypothermia strategies. The results highlight possible renoprotective effects of lower temperatures and support the hypothesis that lower temperatures may be more protective of renal function. These findings may have implications for intraoperative temperature management, however further studies are needed to confirm the findings.