EFFECT OF ALPHA-STAT VERSUS PH-STAT STRATEGIES ON CEREBRAL OXIMETRY DURING MODERATE HYPOTHERMIC CARDIOPULMONARY BYPASS

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The acid-base management during moderate hypothermic CPB using the alpha-stat versus the pH-stat strategy is a controversial issue. During the alpha-stat strategy, the temperature-uncorrected $P_aCO_2$ is maintained near 40mmHg while the temperature-corrected $P_aCO_2$ is decreased. However, during the pH-stat strategy, the temperature-corrected $P_aCO_2$ is maintained near 40 mmHg while the temperature-uncorrected $P_aCO_2$ is increased.

The report shows during moderate hypothermic hemodilutional cardiopulmonary bypass using the alpha-stat strategy of carbon dioxide homeostasis that there is a significant increase in the mixed venous saturation associated with a paradoxical decrease in the cerebral oxygen saturation as compared with the pre-bypass $S_vO_2$ and $R_sO_2$. Shifting from the alpha-stat to the pH-stat strategy while maintaining the hematocrit, the pump flow, and the mean arterial pressure at the same level resulted in a significant increase in the temperature-corrected $P_aCO_2$ from $26.7\pm3.6mmHg$ to $38.9\pm3.9mmHg$ which was associated with a significant increase of cerebral oxygen saturation from $62.9\pm6.3\%$ to $72.1\pm6.6\%$. However, the mean temperature-corrected corrected $P_aCO_2$ during alpha-stat strategy ($26.7\pm3.6mmHg$) shows that the corresponding $R_sO_2$ is about $65\%$ which is significantly higher than the mean $R_sO_2$ of $59.6\%$ in the awake patients breathing room air (Fig. 1). This correlation suggests that the alpha-stat strategy can be a safe technique for managing carbon dioxide homeostasis during moderate hypothermic hemodilutional cardiopulmonary bypass.
Figure 1: Correlation between the cerebral oxygen saturation (R\textsubscript{sO2}) and temperature-corrected arterial carbon dioxide tension (temperature-corrected P\textsubscript{a}CO\textsubscript{2}). The mean temperature-corrected P\textsubscript{a}CO\textsubscript{2} during “alpha-stat” (27.3 mmHg) corresponds with an R\textsubscript{sO2} of 63%, while the mean temperature-corrected P\textsubscript{a}CO\textsubscript{2} during “pH-stat” (38.9 mmHg) corresponds with an R\textsubscript{sO2} of 72%.