Triple H syndrome

Avalanche patients who are completely buried but still able to breathe are exposed to hypothermia, hypoxia and hypercapnia (triple H syndrome). Little is known about how these pathologic changes affect brain physiology. A study aimed to investigate the effect of hypothermia, hypoxia and hypercapnia on brain oxygenation and systemic and Cerebral hemodynamics. Anaesthetised pigs were surface-cooled to 28°C. Inspiratory oxygen (FiO2) was reduced to17% and hypercapnia induced. Haemodynamic parameters and blood gas values were monitored. Cerebral measurements included cerebral perfusion pressure (CPP), brain tissue oxygen tension (PbtO2), cerebral venous oxygen saturation (ScvO2) and regional cerebral oxygenation saturation (rSO2). Tests were interrupted when haemodynamic instability occurred or 60 min after hypercapnia induction. ANOVA for repeated measures was used to compare values across phases. There was no clinically relevant reduction in cerebral oxygenation (PbtO2, ScvO2, rSO2) during hypothermia and initial FiO2 reduction. Hypercapnia was associated with an increase in pulmonary resistance followed by a decrease in cardiac output and CPP, resulting in haemodynamic instability and cerebral desaturation (decrease in PbtO2, ScvO2, rSO2). Hypercapnia may be the main cause of cardiovascular instability, which seems to be the major trigger for a decrease in brain oxygenation in triple H syndrome despite severe hypothermia [1)].

1)
Strapazzon G, Putzer G, Dal Cappello T, Falla M, Braun P, Falk M, Glodny B, Pinggera D, Helbok R, Brugger H. Effects of hypothermia, hypoxia and hypercapnia on brain oxygenation and haemodynamic parameters during simulated avalanche burial - a porcine study. J Appl Physiol (1985). 2020 Nov 5. doi: 10.1152/japplphysiol.00498.2020. Epub ahead of print. PMID: 33151777.