

The Effect of Hyperbaric Hyperoxia on the Pharmacokinetics of Caffeine in Healthy Male Volunteers

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Background: Hyperbaric oxygen therapy (HBO) has been applied to the patients with air or gas embolism, carbon monoxide poisoning, gas gangrene, necrotizing soft tissue injury and compromised skin grafts. It is regarded as a drug, which can cause drug interaction and is associated with physiological changes involving the respiratory and cardiovascular system. The effect of hyperbaric hyperoxia on the pharmacokinetics of caffeine was investigated in 4 healthy male volunteers.

Methods: 500 mL of coffee were administered to 4 healthy male volunteers and blood samples were serially collected for 24 h in a normobaric period. After 7-days wash-out period, same coffee were administered to same volunteers and blood samples were serially collected. The volunteers entered a hyperbaric chamber 2.5 h following coffee ingestion for 80 min (30 fsw, 100 % O₂-breathing). The plasma were analyzed to measure the caffeine concentration by high performance liquid chromatography. The caffeine amount administered was determined by analyzing an aliquot of the coffee beverage. Pharmacokinetic parameters of caffeine in two different conditions were analyzed by non-compartmental methods. Effects of hyperbaric hyperoxia on caffeine disposition were investigated using a non-parametric statistical methods.

Results: All volunteers did not show the adverse reaction relating caffeine administration including oxygen toxicity during a total period of study. Mean AUC_{total}, C_{max} and Cl of normobaric period were $34.27 \pm 10.1 \mu\text{g} \times \text{hr/mL}$, $4.43 \pm 0.64 \mu\text{g/mL}$ and $120.09 \pm 37.56 \text{ mL/hr}$, respectively. Mean AUC_{total}, C_{max} and Cl of hyperbaric hyperoxic period were $45.65 \pm 9.89 \mu\text{g} \times \text{hr/mL}$, $5.72 \pm 0.61 \mu\text{g/mL}$ and $85.36 \pm 17.83 \text{ mL/hr}$, respectively. The difference of all pharmacokinetic parameters were not statistically significant ($p > 0.05$).

Conclusion: The pharmacokinetics of caffeine do not seem to be influenced in a clinically relevant way in humans during a stay for 80 min at 30 fsw, 100% O₂ and further investigation is needed to evaluate the subtle effect of hyperbaric hyperoxia on the pharmacokinetic/pharmacodynamic characteristics of caffeine.