

Detection of Dehydration by Using Volume Kinetics.

Zdolsek J, Li Y, Hahn RG. *Anesth Analg*. 2012 Oct;115(4):814-22.

Background

Patients admitted to surgery may be dehydrated, which is difficult to diagnose except when it is severe (>5% of the body weight). We hypothesized that modest dehydration can be detected by kinetic analysis of the blood hemoglobin concentration after a bolus infusion of crystalloid fluid.

Methods

Four series of experiments were performed on 10 conscious, healthy male volunteers. Separated by at least 2 days, they received 5 or 10 mL/kg acetated Ringer's solution over 15 minutes. Before starting half of the IV infusions, volume depletion amounting to 1.5 to 2.0 L (approximately 2% of body weight) was induced with furosemide. The elimination clearance and the half-life of the infused fluid were calculated based on blood hemoglobin over 120 minutes. The perfusion index and the pleth variability index were monitored by pulse oximetry after a change of body position.

Results

Dehydration decreased the elimination clearance of acetated Ringer's solution [median (25th-75th percentile)] from 1.84 (1.23-2.57) to 0.53 (0.41-0.79) mL/kg/min (Wilcoxon matched-pair test $P < 0.001$) and increased the half-life from 23 (12-37) to 76 (57-101) minutes ($P < 0.001$). The smaller infusion, 5 mL/kg, fully discriminated between experiments performed in the euhydrated and dehydrated states, whereas the urinary excretion provided a less-reliable indication of hydration status. Dehydration decreased the perfusion index but did not affect the pleth variability index.

Conclusion

Dehydration amounting to 2% of the body weight could be detected from the elimination clearance and the half-life of an infusion of 5 mL/kg Ringer's solution.