

Arterio-Venous Hemoglobin Differences in Healthy Subjects during Rapid Volume Expansion.

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Introduction

Venous and arterial hemoglobin values are used interchangeably in the clinical environment to monitor anemia and guide transfusion decisions. Differences in steady state capillary, venous and arterial hemoglobin have been noted previously.(1-2) Some studies have examined the effects of dependent pooling on hemoconcentration.(3-4) Differences in plasma volume distribution generally explain venous hemoconcentration.(5) Hemoglobin variation due to sampling type during changing hemodynamic status has not been critically evaluated. We examined the relationship between venous and arterial hemoglobin in healthy subjects during rapid volume expansion with isotonic fluid.

Methods

Four time-matched venous and arterial hemoglobin samples were collected from healthy volunteers aged 18-30 years during hemodilution with Isolyte® (40cc/kg) following phlebotomy of 1 unit whole blood. Each subject had 2 peripheral intravenous and 1 radial artery line. Samples were collected at T₀) before phlebotomy or infusion; T₁) after phlebotomy and 11% total infusion; T₂) after 78% infusion and; T₃) after 100% infusion. Values were then analyzed to determine arterial and venous hemoglobin concentration changes induced by rapid volume expansion.

Results

Data from 107 subjects was analyzed. Venous hemoglobin was generally higher than arterial through out each study. When the difference in average venous and arterial hemoglobin readings between time points was analyzed the change in venous hemoglobin was consistent with that of arterial hemoglobin. No exclusive patterns were observed among males versus females.

Conclusion

Our analysis demonstrates that hemoconcentration is relatively preserved and homeostatic mechanisms to maintain plasma volume distribution are stable in healthy, supine-positioned subjects during rapid volume expansion with isotonic solution. These results further our understanding of hemodynamics and provide additional evidence that arterial and venous hemoglobin values from the same individual are not interchangeable. In the future, it may be useful to analyze arterio-venous patterns in hospitalized patients primarily with hemoglobin less than 7 g/dl to determine how illness or clinically significant anemia modifies this difference.

References:

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Figure 1

