The Effect of Shock on Tissue Oxygen Levels in Dogs

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In the Literature

Berg AN, Conzemius MG, Evans RB, Tart KM. Evaluation of tissue oxygen saturation in naturally occurring canine shock patients. *J Vet Emerg Crit Care (San Antonio)*. 2019; 29(2):149-153.

FROM THE PAGE ...

Shock is a life-threatening condition that can occur secondary to various clinical conditions and results in decreased oxygen delivery to tissue. Near-infrared spectroscopy is a noninvasive diagnostic tool that has been investigated as a means to continuously measure tissue oxygen saturation (StO_2), which can be a marker of oxygen delivery to tissue and useful in the diagnosis of shock. It is unknown whether StO_2 measurements reflect shock in dogs presented emergently or whether alterations in StO_2 are associated with illness severity or mortality.

This prospective, clinical study performed over 4 years in a veterinary teaching hospital evaluated 25 dogs with naturally occurring shock, excluding cardiogenic shock. Data collected on each dog, including peripheral oxygen saturation, blood pressure, lactate levels, and blood gas analysis, were used to calculate the Acute Patient Physiologic and Laboratory Evaluation (APPLE) score to stratify illness severity. Higher APPLE scores are associated with higher illness severity. StO_2 measurements were obtained before any treatments were administered.

Of the dogs enrolled, mean StO_2 was 65.12% (±17.7%) and ranged from 23% to 92%. Hyperlactatemia was common in this patient population. A low StO_2 was moderately correlated with increased APPLE scores, and single StO_2 measurements were not predictive of mortality. The APPLE score, calculated based on physical examination, laboratory, and diagnostic test findings, was the only factor in this particular study that was predictive of whether a patient would survive.

Dogs emergently presented in shock will have low StO_2 values, which is consistent with expected poor oxygen delivery to tissue during shock. Low StO_2 is associated with more severe disease, but a single StO_2 measurement may not be helpful in predicting whether a patient will survive. Calculating the APPLE score to identify the sickest patients may be useful when providing prognostic information to owners. Although measuring StO_2 is quick and noninvasive, the clinical utility of StO_2 is limited, as the equipment is not readily available in most clinics and further information is needed to determine how StO_2 levels relate to patient outcomes over time.

... TO YOUR PATIENTS

Key pearls to put into practice:

1. StO_2 can be used as an adjunctive measure of disease severity in patients with shock.
2. Illness severity scores (eg, APPLE score) can be used to provide prognostic information for owners of critically ill dogs in shock.
3. Stabilization of dogs in shock should focus on optimizing tissue perfusion and oxygen delivery to ensure the best outcome for the patient.

Suggested Reading

Engbers S, Boysen SR, Engbers J, Chalhoub S. A comparison of tissue oxygen saturation measurements by 2 different near-infrared spectroscopy monitors in 21 healthy dogs. *J Vet Emerg Crit Care (San Antonio)*. 2014;24(5):536-544.

Hayes G, Mathews K, Doig G, et al. The acute patient physiologic and laboratory evaluation (APPLE) score: a severity of illness stratification system for hospitalized dogs. *J Vet Intern Med*. 2010;24(5):1034-1047.

Salcedo M, Tart K, Hall K. A systematic review of human and veterinary applications of noninvasive tissue oxygen monitoring. *J Vet Emerg Crit Care (San Antonio)*. 2016;26(3):323-332.