

Drugs for Cardiovascular Support in Anesthetized Horses

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KEYWORDS

- Cardiovascular support • Anesthesia • Horses • Inotropes • Chronotropes
- Vasopressors

KEY POINTS

- Despite balanced anesthesia and fluid therapy, drugs are often needed for cardiovascular support in anesthetized horses.
- In most cases inotropes are preferred, and dobutamine remains the agent of choice in most horses.
- Treat hypocalcemia with calcium salts.
- Use vasopressors when hypotension is caused by vasodilation while cardiac output and/or HR are high or when hypotension is not responsive to fluids and inotropes.
- Order of decreasing inotropic and increasing vasopressor effect: dobutamine, dopamine, ephedrine, noradrenaline, phenylephrine.
- Phosphodiesterase III inhibitors and vasopressin (analogues) are promising for future research.
- Combinations of drugs for cardiovascular support can be useful.

INTRODUCTION

Reduced tissue oxygenation may contribute to a higher anesthesia-related mortality rate in horses.¹ Tissue oxygen supply depends on oxygen delivery (DO_2), individual tissue perfusion, and oxygen consumption. Oxygen delivery is the product of arterial oxygen content (CaO_2) and cardiac output (\dot{Q}_t). Individual tissue perfusion depends on \dot{Q}_t , precapillary arteriolar tone (which also determines systemic vascular resistance [SVR]), and vascular transmural pressure. Transmural pressure is the force that maintains vessel patency and represents the difference between intravascular and extravascular pressures, so it is highly influenced by the arterial blood pressure (ABP) and will more likely become insufficient in tissues with high extravascular pressures (eg, dependent muscles in recumbent horses). Inadequate tissue oxygen supply usually results from decreases in one or more of the following:

- CaO_2
- \dot{Q}_t (= heart rate [HR] \times stroke volume [SV])

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- ABP (determined by circulating volume, \dot{Q}_t , and SVR)
- Local arteriolar tone in the specific tissue considered

The complicated interplay between these factors is illustrated in **Fig. 1**. Because horses have a high body weight and easily develop ventilation-perfusion mismatching and cardiovascular depression during anesthesia,^{2,3} cardiovascular support is extremely important in maintaining tissue oxygenation.

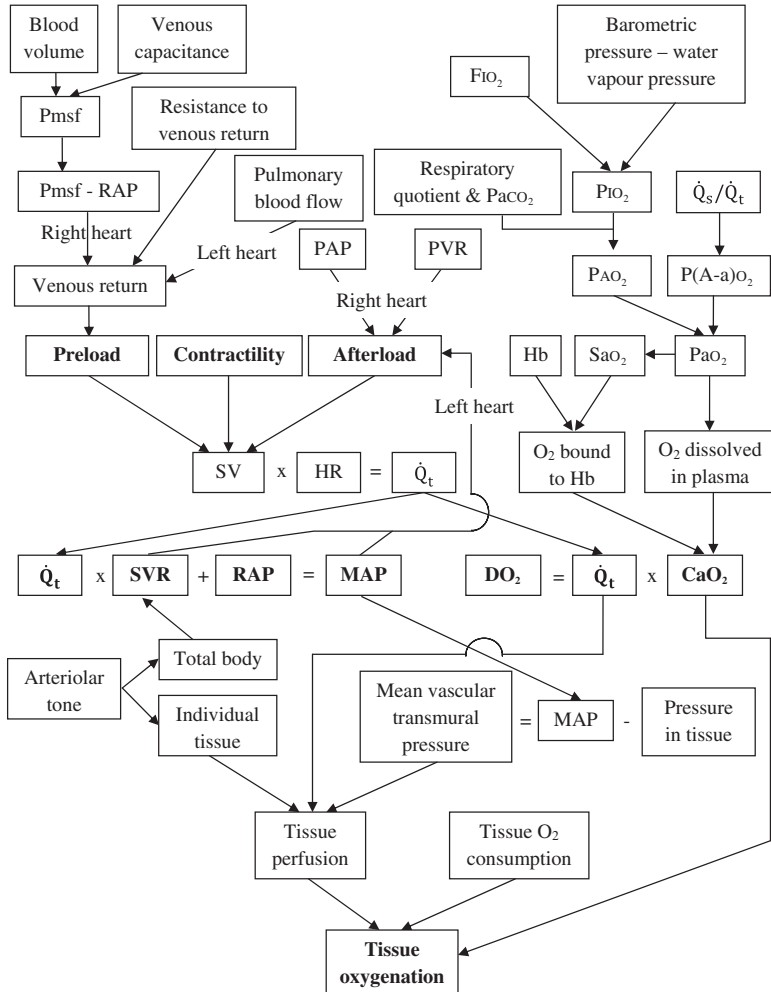


Fig. 1. Overview of the different factors that play a role in determining tissue oxygenation. CaO₂, arterial oxygen content; DO₂, oxygen delivery; F_{iO₂}, inspiratory oxygen fraction; Hb, hemoglobin concentration; HR, heart rate; MAP, mean arterial pressure; P(A-a)_{O₂}, alveolar to arterial oxygen tension difference; P_{AO₂}, alveolar oxygen tension; P_{aO₂}, arterial oxygen tension; PAP, pulmonary artery pressure; P_{iO₂}, inspiratory oxygen tension; Pmsf, mean systemic filling pressure; PVR, pulmonary vascular resistance; \dot{Q}_s/\dot{Q}_t , degree of venous admixture; \dot{Q}_t , cardiac output; RAP, right atrial pressure; SaO₂, arterial oxygen saturation; SV, stroke volume; SVR, systemic vascular resistance.

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