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Background and Goal

Induction of general anesthesia regularly induces arterial hypotension, which is often treated with phenylephrine. As a pure α -agonist, phenylephrine is conventionally thought to increase afterload but not cardiac preload. The aim of this study is to describe the initial time course of the effects of phenylephrine on various hemodynamic variables, and to evaluate whether phenylephrine, could be beneficial for preload optimisation as well.

Materials and Methods

After IRB approval and written IC, 26 patients scheduled for sigmoidectomy were included. MAP, HR, EtCO₂, CVP, SV, CO, PPV, SVV and SVR were recorded continuously. All patients were ventilated in volume control mode with a tidal volume of 8 ml/kg. After induction of Target Controlled propofol/remifentanyl anesthesia, when the MAP dropped below 80% of baseline value for >3 minutes in the subsequent period without surgical stimuli, phenylephrine 2 μ g/kg was administered. The averaged curves of the investigated variables were calculated and the absolute values at the moment before administration of phenylephrine (T₀) and 5 and 10 minutes thereafter were compared. Significant changes from T₀ were assessed using a paired T-test (P<5%).

Results and Discussion

The MAP, SV, CO, CVP and EtCO₂ increased by 62%, 28%, 26%, 33% and 11%, respectively, while PPV and SVV dropped by 40% and 54%, respectively. The initial increase in MAP is perfectly aligned with the increase in SVR, which is expected based on the arterial α -effect. Both curves, however, decouple after 120 seconds. Together with the changes in PPV, CVP, EtCO₂ and CO, this comprise five independent indices of improved venous return following phenylephrine administration.

Conclusion

In patients with anesthesia-induced hypotension, phenylephrine increases the cardiac output by virtue of an increase in venous return.

	T ₀	T ₅	T ₁₀
MAP (mmHg)	54(8)	88(16)*	67(12)*
HR (bpm)	72(10)	70(12)*	70(11)*
EtCO ₂ (mmHg)	38(4)	42(5)*	40(5)*
CVP (mmHg)	8(5)	11(6)*	9(5)*
CO (L.min ⁻¹)	3.9 (0.87)	4.9 (1.2)*	4.7 (1.23)*
SV (ml)	55(10)	70(14)*	67(14)*
PPV (%)	20(7)	9(5)*	13(5)*
SVV (%)	19(3)	11(6)*	14(6)*
SVR (dyn.s.cm ⁻⁵)	1035(305)	1421(499)*	1103(350)*

Table: Mean (SD) values of the hemodynamic variables: before administration of phenylephrine (T₀) and 5 and 10 minutes thereafter. *P<0.05 vs T₀

Hemodynamic changes after phenylephrine

