

Perfusion Index - A Valuable Tool to Assess Changes in Peripheral Perfusion Caused By Sevoflurane?

Hager H., Reddy D., Kurz A. *Anesthesiology* 2003; 99: A553.

Introduction

Under physiologic conditions peripheral perfusion is regulated by the autonomic nervous system. During anesthesia this regulation system is impaired. As a result most anesthetics increase the vasodilation threshold and markedly decrease the vasoconstriction threshold.(1) To assess arterio venous shunt thermoregulatory vasomotion the forearm-fingertip temperature gradient has been used in many studies. A gradient of 0 is considered the threshold while a gradient of 4 reflects the maximum intensity of vasoconstriction. It has also been shown that the pulse oximeter based flow index correlates well with finger volumes plethysmography and forearm-fingertip temperature gradients.(2) Although the gradients are helpful in determining thermoregulatory thresholds they might not be sensitive enough to accurately and in real time assess peripheral perfusion during other clinical situations such as sympatho adrenergic activation, pain and hypovolemia. Several companies offer pulse oximeter equipped with the ability to display a perfusion index, which is derived from absorption of two infrared wave lengths. Consequently we tested the hypothesis that the perfusion index measured with a pulse oximeter correlates better with endtidal sevoflurane concentration during anesthesia than the forearm-fingertip temperature gradient.

Methods

To compare the fore-arm fingertip gradients with the perfusion index we included 7 patients undergoing major abdominal surgery lasting for at least 2 hours. Anesthesia was induced with propofol and fentanyl and was maintained with sevoflurane and morphine. The forearm-fingertip temperature gradient was monitored using Mon-a-Therm thermocouples (Mallinckrodt Anesthesiology Products, Inc., St. Louis, MO, USA) taped to the patients' index finger and the forearm. The perfusion index was monitored using the pulse oximeter Masimo SET ® (Masimo Corporation, Irvine, CA). Data was recorded starting 20 minutes after induction of anesthesia until end of surgery. Data analysis was performed using Pearson's correlation coefficient to measure linear relationship.

Results

150 paired data points were recorded and 129 could be used for the calculation. All patients underwent major abdominal surgery, lasting 3.6 ± 0.5 hours. Endtidal sevoflurane concentrations varied from 0.5% to 3.8%. The Perfusion index did show statistically significant correlation with end-expiratory sevoflurane ($R=0.48$, $p<0.001$). The forearm-fingertip gradient did not correlate significantly with sevoflurane ($R=0.05$, $p=0.5$), and also did the perfusion index not correlate with forearm-fingertip gradients. ($R=0.22$, $p=0.15$).

Conclusion

The perfusion index appears to be an accurate tool to assess changes in peripheral perfusion caused by an inhalational agent like sevoflurane. It might thus be of future value in assessment of perioperative changes in peripheral perfusion due to different anesthetic conditions.

1) Matsukawa, T., et al., *Anesthesiology*, 1995. 82: p. 1169-1180; 2) Ozaki, M., et al., *Anesthesiology*, 1993. 79: p. A542.