

The Perfusion Index Measured By a Pulse Oximeter Indicates Pain Stimuli in Anesthetized Volunteers.

Hager H., Church S., Mandadi G., Pulley D., Kurz A. *Proceedings of the 2004 Annual Meeting of the American Society of Anesthesiologists*: A514

Introduction

Under physiologic conditions peripheral perfusion is regulated by the autonomic nerve system. During anesthesia this system is impaired due to the vasodilative effect of anesthetic drugs. This effect leads to redistribution of temperature and temperature loss and can effectively be monitored by the forearm fingertip temperature gradient. A new method of measuring peripheral perfusion is the perfusion index displayed on a pulse oximeter. The perfusion index is measured by the pulse oximeter for internal signal quality evaluation and is the relation between pulsatile and constant absorbed light in the finger. Major determinant of the perfusion index is vasoconstriction or vasodilation of peripheral vessels due to temperature, volume status and endtidal inhaled anesthetics like Sevoflurane.(1) Also pain is known to induce vasoconstriction, but it is unknown if this effects peripheral perfusion under the vasodilated condition in normothermic anesthetized subjects.

Methods

We obtained informed consent after IRB approval from 2 healthy volunteers aged 28 and 33. The volunteers were monitored with ECG, NIBP and a Masimo® Radical SET pulse oximeter (Irvine, CA, USA) displaying the perfusion index. Anesthesia was induced using Propanol 2mg/kg and maintained with Sevoflurane as a single agent anesthesia. We assigned the volunteers to 4 different concentrations of Sevoflurane (1% , 1,5%, 2% and 2,5%) in random order. In each condition we applied a standardized painful (electrical) stimulus via two 25-g needles which were inserted intradermally into the lower portion of each anterior thigh. A bilateral 65-70 milliamper, 100-Hertz tetanic electrical current, maintained for 10 seconds, provided the noxious stimulus.

Results

As expected the painful stimulus caused significant increase in heart rate from 62.5 ± 9.5 to 80.38 ± 13.18 ($p=0.01$) and a significant increase in mean arterial pressure from 70.75 ± 9.44 to 92 ± 15.11 ($p=0.005$). The average baseline perfusion index before each stimulus was 11.07 ± 1.19 . Painful stimulus caused a significant decline of the perfusion index 5.42 ± 2.39 ($p<0.001$). There was a weak correlation between endtidal sevoflurane concentration and perfusion index. ($r^2=0.343$) There was also a weak correlation between endtidal sevoflurane concentration and the decline of the perfusion index during painful stimulus ($r^2=-0.4$).

Conclusion

The perfusion index is able to independently indicate a pain stimulus in anesthetized volunteers in different concentrations of Sevoflurane. Thus it may be of clinical value to assess pain.

1) Hager et al. *Anesthesiology* 2003; 99:593.

Figure 1

