

A Comparison of Lidocaine and Bupivacaine Digital Nerve Blocks on Noninvasive Continuous Hemoglobin Monitoring in a Randomized Trial in Volunteers

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Background

Blood hemoglobin can be monitored continuously and noninvasively with a noninvasive spectrophotometric sensor (Masimo SpHb). The perfusion index (PI) of the finger is directly related to the clinical accuracy of SpHb. We evaluated those variables that influence PI without the influences of surgery and anesthesia.

Methods

Based on our past studies, 12 awake adult volunteers were studied. A SpHb sensor was attached to the same finger of each hand. The temperature of each finger was measured via a skin surface probe. A digital nerve block (DNB) was performed with 1% lidocaine on one finger and 0.25% bupivacaine on the other finger of the opposite hand. SpHb, PI, and finger temperature were monitored continuously 30 minutes before and 3 to 4 hours after placement of the DNB. A random effects spline regression was used to flexibly model the outcomes before and after the DNB and to compare the effects of lidocaine and bupivacaine.

Results

The DNBs increased the PI for both lidocaine and bupivacaine ($P < 0.0001$) and finger temperature from both lidocaine ($P < 0.0001$) and bupivacaine ($P = 0.02$). The duration of action of bupivacaine was markedly longer than that of lidocaine ($P < 0.0001$). Between 45 and 75 minutes after insertion of the DNB, the PI with bupivacaine was substantially higher than that of lidocaine. The PI was directly related to changes in finger temperature and SpHb. During this time interval, 11 of the 12 volunteers receiving bupivacaine descriptively had increases in finger temperature ranging from no change to 6.1°C. In contrast, only 6 of the 12 lidocaine volunteers had increases in finger temperature ranging from no change to 4°C. Changes in PI were directly correlated with SpHb values (correlation coefficient = 0.7).

Conclusions

A DNB increases PI and finger temperature. These increases lasted 2 to 3 hours longer with bupivacaine than lidocaine. The increases in PI were associated with slightly higher SpHb values. We conclude that the DNB induces increases in PI and temperature of the finger. Because of the close relationship between finger temperature, PI, and SpHb, consistently increasing finger temperature and PI could increase the accuracy of SpHb.