PEDIATRIC ANESTHESIA II

Title: HEMODYNAMIC AND CARDIOVASCULAR EFFECTS OF HALOTHANE AND ISOFLURANE ANESTHESIA IN CHILDREN

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Introduction. Isoflurane is associated with less myocardial depression than halothane in adult patients1, but similar studies have not been performed in children. This is the first study comparing the cardiovascular and hemodynamic effects of these two agents in children without the confounding variables of N2O or premedication.

Methods. Fourteen unpremedicated children (age 2-7 yrs.) undergoing elective surgery were randomly assigned to receive halothane(H) or isoflurane(F) anesthesia. Informed parental consent was obtained after approval of our Institutional Review Board. Cardiovascular parameters were obtained by M-mode echocardiography (Hoffrel 800 Ultrasound). Data acquisition consisted of blood pressure (Dinamap 844), heart rate, M-mode echos of the left ventricle and aortic root. A carotid was used to maintain end tidal (ET) CO2 between 30-40 mmHg during induction. ETI and ETI were measured (Gema Ergatron) and study data was collected at 3 equispot ET concentrations:

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<tr>
<th>DOSAGE LEVEL</th>
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<th>1</th>
<th>2</th>
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<tbody>
<tr>
<td>Group H</td>
<td></td>
<td>0.5%</td>
<td>1.0%</td>
<td>1.5%</td>
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<tr>
<td>Group F</td>
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<td>0.74%</td>
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Awakes (control) and induction data included: mean blood pressure(MBP), heart rate(HR), shortening fraction(LVSF), mean velocity of circumferential shortening(Vcf), and prejection period/left ventricular ejection time(PEP/LVET). Equipsent concentrations of H(N=9) and F(N=5) were given and progressively increased at 5 minute intervals. Data collection occurred at each anesthetic level. Data was analyzed as a 2 Factor repeated measure experiment by using an analysis of variance with a simple effect analysis.

Results. HR was not significantly altered from baseline at any anesthetic level in Group H or F. MBP fell significantly(p<0.0001) after induction with either agent with comparable hypotension in both groups at all dosage levels. Awakes measurements of ventricular function were similar for both groups, but significant differences were present between agents after induction. Ventricular function was significantly depressed in Group H in a dose-dependent manner while Group F showed no significant change from baseline at any dosage level. LVSF fell progressively in Group H while it remained essentially unchanged in Group F at all levels (p<0.05) (Figure 1). Mean Vcf demonstrated similar changes (p<0.05). The PEP/LVET was significantly prolonged at dosage levels 2 and 3 in Group H(p<0.05) but significantly decreased in Group F at levels 2 and 3 (p<0.05) (Figure 2).

Discussion. Hemodynamic measurements(HR,MBP) demonstrated no significant differences between anesthetic agents at any concentration. In contrast to published studies1-4,HR did not significantly change following H or F induction. This study concurs with previous work showing halothane markedly depresses myocardial function in a dose-dependent fashion. Isoflurane, however, produced no significant change in myocardial function at any anesthetic level. This suggests isoflurane is associated with less myocardial depression than halothane in children. Furthermore, measurements of HR and MBP do not accurately reflect alterations in myocardial function during anesthetic administration. This study was supported by the Southern Medical Association.

References

Figure 1: Mean changes in left ventricular shortening fraction with increasing dosage level. Significant changes from baseline are noted.

Figure 2: Mean values of PEP/LVET with increasing dosage level. Significant changes from baseline are noted.