Variation in the intracuff pressure in cuffed endotracheal tubes during cardiac surgery in infants and children

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**Background:**
- Recent studies have shown that cuffed endotracheal tubes (cETT) can be used safely in pediatric patients.
- However, various factors may affect the intracuff pressure (CP) during prolonged surgical procedures.
- The relative hypotension seen during cardiopulmonary bypass (CPB) can be an additional concern especially in pediatric patients with unmonitored and inflated cuffs.
- In this study, we monitored the CP continuously in infants and children subjected to CPB.

**Methods:**
- IRB approved.
- Prospective, observational clinical study.
- Inclusion criteria:
  - Patients undergoing cardiac surgery with CPB
- No change in our standard anesthetic care:
  - After placement of the cETT, the cuff was inflated using the air-leak test with a CPAP of 20 cmH₂O in the anesthesia circuit
  - The inflating port of the pilot balloon was connected to the TD of the IPMS
  - The CP, body temperature, and MAP were recorded every 30 minutes

**Result**
- The study cohort consisted of 17 patients.
- Mean CP at inflation of the cuff: 13.0 ± 6.8 cmH₂O
- Over time, the change in CP from baseline:
  - 0.1 ± 4.3 at a body temperature of 35-37°C
  - -4.9 ± 2.6 cmH₂O (p<0.01) at 31-33°C
  - -10.6 ± 5.4 cmH₂O (p<0.01) at 27-29°C
  - -13.2 ± 4.9 cmH₂O (p<0.01) at <27°C
  With normalization of body temperature (36-37°C), CP returned back to baseline (mean difference of -0.3 cmH₂O from the initial CP).

**Discussion**
- The CP in a cETT is influenced by multiple intraoperative factors - temperature, N₂O and the position of the head and neck.
- The current study revealed a linear decrease in the CP with decrease in temperature during CPB followed by a return of the CP to baseline as the temperature normalized.
- This variability of the CP and its multi-factorial dependence suggest that continuous monitoring of CP may be beneficial in this patient population.

**Measurement**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>8 days to 6.6 years (1.5 ± 1.8 years)</td>
</tr>
<tr>
<td>Weight</td>
<td>3.3 to 22.5 Kgs (8.2 ± 4.9 Kgs)</td>
</tr>
<tr>
<td>Size of the cuffed ETT</td>
<td>3.0mm – 5.0 mm ID</td>
</tr>
</tbody>
</table>

**Change in CP (cm H₂O)**

<table>
<thead>
<tr>
<th>Body temperature (°C)</th>
<th>Change in CP (cm H₂O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-37°C</td>
<td>0.1</td>
</tr>
<tr>
<td>31-33°C</td>
<td>4.9</td>
</tr>
<tr>
<td>25-27°C</td>
<td>10.6</td>
</tr>
<tr>
<td>&lt;25°C</td>
<td>13.2</td>
</tr>
<tr>
<td>36-37°C</td>
<td>-0.3</td>
</tr>
</tbody>
</table>

**References**