The Effect of transesophageal echocardiography Probe Insertion on Intracuff Pressure of an Endotracheal tube in Infants and Children

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**Introduction**

- Hyperinflation of the cuff can compromise tracheal mucosal perfusion. The risk can be higher in younger children as the mucosal perfusion pressure is lower.
- Several intraoperative factors can dynamically alter the intracuff pressure exerted by the cuff on the tracheal wall.

**Methods**

- This prospective study included children less than 16 years ago undergoing cardiac surgery and TEE.
- Patients with pre-existing tracheal or esophageal pathology were excluded.
- After placement of an ETT (Microcuff®, Kimberly-Clark), the cuff was inflated using the air-leak technique to a CPAP of 20 cmH₂O.
- There were 3 types of TEE probes used in this study. The smallest probe (s8-3t microTEE probe, Philips) was applied for neonates or those in whom the middle sized probe (GE 9T TEE, GE) could not be inserted. The larger probe (GE 6T TEE, GE) was used for patients weighing more than 15 kilograms.
- The intracuff pressure during TEE exam (P3) was measured every 2 minutes.
- Statistical analysis was performed using a paired t-test.

**Results**

### Intracuff pressure following insertion of TEE probe

<table>
<thead>
<tr>
<th>Group</th>
<th>Age (years)</th>
<th>Wt (kg)</th>
<th>Intracuff pressure (cmH₂O)</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>All (n=58)</td>
<td>3.5 ± 4.0</td>
<td>15.1 ± 12.5</td>
<td>17 ± 10</td>
<td>24 ± 12</td>
<td>21 ± 10</td>
<td>19 ± 12</td>
<td></td>
</tr>
<tr>
<td>A: &lt;1 year (n=21)</td>
<td>0.5 ± 0.2</td>
<td>6.2 ± 1.6</td>
<td>14 ± 9</td>
<td>18±6</td>
<td>16±8</td>
<td>14±8</td>
<td></td>
</tr>
<tr>
<td>B: 1-4 years (n=21)</td>
<td>2.6 ± 0.9</td>
<td>11.9 ± 2.3</td>
<td>17 ± 10</td>
<td>27±14</td>
<td>23±11</td>
<td>24±14</td>
<td></td>
</tr>
<tr>
<td>C: 5-8 years (n=9)</td>
<td>6.7 ± 1.0</td>
<td>23.6 ± 7.9</td>
<td>20 ± 13</td>
<td>27±19</td>
<td>20±18</td>
<td>17±8</td>
<td></td>
</tr>
<tr>
<td>D: 9-16 years (n=7)</td>
<td>12.2 ± 2.4</td>
<td>40.4 ± 14.3</td>
<td>20 ± 6</td>
<td>32±9</td>
<td>27±12</td>
<td>24±11</td>
<td></td>
</tr>
</tbody>
</table>

* Statistically significant increase compared to P1 (p < 0.05).
* Statistically significant decrease compared to P2 (p < 0.05).
* Statistically significant decrease compared to P3 (p < 0.05).

- There was a significant increase of the intracuff pressure from P1 to P2 (p < 0.001) and a significant decrease from P2 to P3 (p = 0.002). These changes were observed within each age group in the study.
- The increase in intracuff pressure from P1 to P2 was smaller in infants (4 ± 6 cmH₂O) than older children (Group B, C and D, 10 ± 10 cmH₂O).

**Discussion & Conclusion**

- Since the esophagus is in contact with the posterior membranous portion of the trachea, a TEE probe inserted into the esophagus can indirectly compress the trachea and increase the pressure exerted by the inflated cuff on the tracheal wall.
- The increase in intracuff pressure associated with TEE probe insertion was noted in infants and children. This increase was less in infants age less than 1 year of age.
- Future studies are needed to determine if there are clinical consequences of this effect.