Analysis and temporal evolution of extubation parameters for patients undergoing single stage Circumferential cervical spine surgery

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Disclosures

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Introduction

• Airway obstruction after post-operative extubation is a dreaded but uncommon complication in patients undergoing circumferential cervical spine surgery (CCSS).

• The cuff leak test (CLT) has been utilized to assess air leak around the endotracheal tube (ETT) which may reflect airway swelling. Its PPV is very low in the general ICU population and there is concern that it could promote prolonged intubations.

• In this prospective observational study, we analyze the temporal evolution of CLT and perioperative factors that may influence it.
Methods

- Twenty patients undergoing single-stage CCSS
- Extubation protocol initiated by ICU and NSGY teams
  - Patients were maintained intubated overnight following surgery. They were extubated if a CLT > 200mL and both ICU and Neurosurgery teams agreed that it was safe.
- Patients extubated in the first postoperative day (9/20) comprised the Early group, and the remaining patients (11/20) the Delayed group.
- Patient and operative data were analyzed as a single group and comparing both groups.
- 2 surgeons
REsults

• The main indication for surgery was cervical deformity.
• Median number of levels fused was 5 anteriorly (range, 1–6) and 6 (1–13) posteriorly
Results

- Patient profiles between both groups were very similar across most patient variables but differed significantly regarding height and infraglottic luminal area (p<.05).
- There were four failed extubations and three patients (15%) required a tracheostomy.
- All three patients who required tracheostomy had been decannulated by postoperative day 50.

<table>
<thead>
<tr>
<th></th>
<th>Study Group</th>
<th>Early Extubation</th>
<th>Delayed Extubation</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>20</td>
<td>8</td>
<td>12</td>
<td>.99 (MW)</td>
</tr>
<tr>
<td>Gender M:F</td>
<td>9:11</td>
<td>4:4</td>
<td>5:7</td>
<td></td>
</tr>
<tr>
<td>Age (years, range)</td>
<td>58.7 (32-75)</td>
<td>60.5 (48-75)</td>
<td>57.5 (32-70)</td>
<td>.54 (T)</td>
</tr>
<tr>
<td>Height (m, range)</td>
<td>1.69 (1.50-1.91)</td>
<td>1.77 (1.60-1.91)</td>
<td>1.65 (1.50-1.83)</td>
<td>.036* (T)</td>
</tr>
<tr>
<td>Weight (kg, range)</td>
<td>90.0 (59.9-146)</td>
<td>94.9 (77.2-116)</td>
<td>86.4 (56.2-146)</td>
<td>.397 (T)</td>
</tr>
<tr>
<td>BMI</td>
<td>31.9 (20.9-58.5)</td>
<td>30.9 (23.2-40.9)</td>
<td>32.4 (20.9-58.5)</td>
<td>.726 (T)</td>
</tr>
<tr>
<td>Calculated tracheal diameter (mm)</td>
<td>23.7 (17.2-31.1)</td>
<td>26.1 (20.5-31.0)</td>
<td>22.1 (17.2-28.3)</td>
<td>.036* (T)</td>
</tr>
<tr>
<td>Measured tracheal diameter (mm)</td>
<td>20.0 (14.0-30.0)</td>
<td>21.1 (15.7-24.1)</td>
<td>19.1 (14.0-30.0)</td>
<td>.36 (T)</td>
</tr>
<tr>
<td>Luminal area, glottis (mm²)</td>
<td>120.1 (43.5-252.6)</td>
<td>142.2 (43.5-252.6)</td>
<td>106.9 (46.8-194.5)</td>
<td>.262 (T)</td>
</tr>
<tr>
<td>Luminal area, infraglottic (mm²)</td>
<td>230.3 (112.6-377.8)</td>
<td>283.2 (166.7-377.8)</td>
<td>191.8 (112.6-307.9)</td>
<td>.028* (T)</td>
</tr>
<tr>
<td>Charlson Comorbidity Index</td>
<td>3 (0-8)</td>
<td>3 (1-5)</td>
<td>3 (0-8)</td>
<td>.714 (MW)</td>
</tr>
<tr>
<td>STOP-Bang</td>
<td>3 (1-7)</td>
<td>3 (2-5)</td>
<td>3 (1-7)</td>
<td>.597 (MW)</td>
</tr>
</tbody>
</table>
Results

- **Predictive of extubation success: Patient height and tracheal (infraglottic) cross-sectional area**

- **3 of 12 patients in the Delayed group failed extubations despite CLT > 200mL**
  - Last unsuccessful patient extubated on POD#9

- **Tracheostomy — all patients decannulated by day #45**

- **CLT>200mL is not the only factor — “audible” cuff leak may work just as well**
Discussion

• By identifying the preoperative, postoperative, and anatomic risk factors in patients undergoing CCSS we can reassure patients, families and treatment teams that even for those who required a tracheotomy, recovery was relatively quick with complete decannulation by day 50.

• It is by no means an “easy” postoperative period and we hope these limited results enable our colleagues to safely navigate this critical period, avoid the dreaded respiratory arrest complication and hopefully build on this experience by determining a CLT value that can be used as a threshold by means of a prospective interventional study.

• It also provides subsidy for the continued education of our residents and fellows in critical care and airway management including the necessary expertise to obtain an emergent infraglottic airway.
summary Points

• This study objectively demonstrates the difficulties in airway management following CCSS and provides useful insight for preoperative planning and counseling.

• Our results suggest that local anatomic factors influence airway outcome more than operative factors.

• The study format does not allow for testing of interventions but we suggest that patients with favorable anatomy (taller, larger infraglottic luminal area) may benefit from a less strict airway management protocol, such as a flexible CLT value as long as an audible leak is present.

• Future Direction – determine an optimal cuff leak value