**Clinical question.**

In infants and children with respiratory failure who require endotracheal intubation, does the use of cricoid pressure or laryngeal manipulation, when compared with standard practice, improve outcome (e.g. success of intubation, aspiration, side effects, etc.)?

**Conflict of interest specific to this question**

No Conflicts

**Search strategy (including electronic databases searched).**

<table>
<thead>
<tr>
<th>PubMed, Embase, Cochrane, AHA Master Library, Google Scholar, Web of Science, hand review of bibliographies in relevant papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cricoid pressure or Sellick's maneuver or Laryngeal manipulation mesh and text words, clinical queries in PubMed</td>
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<tr>
<td>2. endotracheal or tracheal intubation and cricoid pressure</td>
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<tr>
<td>3. cricoid pressure and endotracheal or tracheal intubation</td>
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<tr>
<td>4. endotracheal intubation and aspiration</td>
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<td>5. Sellick JAMA 1961</td>
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<tr>
<td>6. All children, birth to 18 years</td>
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**State inclusion and exclusion criteria**

238 hits were included in initial search. The papers found in the initial search were evaluated for age and relevance to the clinical question. After age criteria and hand review, only 4 remained relating to a medical outcome of any sort in children. There is no animal model. The remainder were mechanical or theoretical models or descriptions of anatomy or address training and retention, but not clinical outcome. There are a number of studies in adults, but they are evaluated and discussed in the adult worksheet separately. One review article was included to give the reader whatever background information they might wish and one adult incidence study was included for purposes of illustration.

**Number of articles/sources meeting criteria for further review:**

6: 2 LOE=2 and 4 LOE=5
## Summary of evidence

### Evidence Supporting Clinical Question

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</table>

- **A** = Return of spontaneous circulation
- **B** = Survival of event
- **Gast** = Gastric insufflation
- **C** = Survival to hospital discharge
- **D** = Intact neurological survival
- **E** = Other endpoint
- **Italics** = Animal studies
- **refl** = Esophageal reflux
Evidence Neutral to Clinical question

<table>
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<tr>
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<th>Kluger 99</th>
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Level of evidence

A = Return of spontaneous circulation  C = Survival to hospital discharge  E = Other endpoint
B = Survival of event  D = Intact neurological survival  Italics = Animal studies

Evidence Opposing Clinical Question

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Level of evidence

A = Return of spontaneous circulation  C = Survival to hospital discharge  E = Other endpoint
B = Survival of event  D = Intact neurological survival  Italics = Animal studies
REVIEWER’S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

The reader is referred to Worksheets A 007 A & B for adults

The question was not whether cricoid pressure could occlude the alimentary tract in children or if could be taught and be correctly applied in children. This eliminated the vast bulk of papers that addressed the anatomy by various means or were observations of fluids of various types getting to the glottis under varying conditions. No study examined the incidence of aspiration in children in the acute setting with or without cricoid pressure. There were, in fact, very few studies that involved children or surrogate models for children.

Fortunately, the risk of aspiration during RSI is likely to be less than 1 per 2000 children and the case mortality is probably less than 5% (Kluger 1999). However, that means that there has not been and will not be a study or combination of studies that will have sufficient numbers to prove that the use of cricoid pressure changes the risk of aspiration during intubation.

Cricoid pressure increases the pressure required to reflux fluid from the stomach to the esophagus (Salem 72 & 85). The importance of this finding in cadavers may mean that gastric contents are less likely to reach the laryngeal inlet in intact children during RSI, however that theory and its association with aspiration, are not proven.

Cricoid pressure may decrease the extent of gastric insufflation during bag-valve-mask ventilation (Moynihan 93, Salem 74). The importance of this is not established for children. It is postulated that gastric distension may impair ventilation or increase the risk of aspiration, but these theories are not proven.

There are contradictory papers regarding the safety and efficacy of cricoid pressure in the setting of actual or suspected cervical spine injury in adults and no studies in children. Therefore, no recommendation for or against its use is suggested.

As it has become the standard of care by common use and there does not appear to be significant risk to its use, no change in its use in the beginning of a RSI can be recommended.

On the other hand, it is clear that any laryngeal manipulation can adversely affect the ability to ventilate with bag-valve-mask and to successfully visualize or intubate the trachea in adults and thus should be used if desired but altered or removed immediately if it impairs ventilation or the speed or ease of intubation (Ellis 2007).

Acknowledgements:


**Citation List**

1. Ellis DY, Harris T, Zideman D. Cricoid pressure in emergency department rapid sequence tracheal intubations: A risk-benefit analysis. Annals of Emergency Medicine. 50(6); Dec 2007 (review)
   
   A critical review of cricoid pressure literature. Presented as a review article only, but extremely well done.

   
   A retrospective review of adult incidents to establish a baseline incidence of aspiration. Not done in children, so incidence in children cannot be established.

   
   (LOE 2 good quality supportive)
   
   A partially randomized crossover study in 59 children ventilated by facemask with gastric inflation assessed by stethoscope held over epigastrium. The possible theory is that air insufflation may increase the possibility of aspiration or that insufflation means that cricoid pressure causes sufficient obstruction to prevent reflux and aspiration. There is no connecting data to prove those assumptions.

   
   (LOE 5 good quality supportive)
   
   Study in 8 infant cadavers having water infused into esophagus via gastroesophageal tube with direct visualization of pharynx. This measured the possibility that cricoid pressure may increase the pressure required to reflux fluid from the stomach to pharynx. No measure of amount of cricoid pressure. Again there is no data that supports this theory for the mechanism of aspiration.

   
   (LOE 2 good quality supportive)
   
   A study in 10 children ventilated by mask at 150% of normal minute ventilation at 19-25 cm H2O and assessed by ml of air in stomach. It is difficult to assess the value of this study as the presence of air in the stomach or the absence of air in the stomach because of the use of cricoid pressure has not been associated with aspiration in children.

   
   (LOE 5 good quality supportive)
   
   A study in 6 adult cadavers like above except with nasogastric tube in place that confirms that a nasogastric tube is not occluded but the esophagus is occluded. This study demonstrates that a nasogastric tube does not interfere with the effect of cricoid pressure on insufflation of air into the stomach.