Subglottic secretion drainage for preventing ventilator associated pneumonia: a meta-analysis

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CRD summary
The review concluded that almost half of cases of ventilator associated pneumonia may be prevented with the use of specialized endotracheal tubes designed to drain subglottic secretions. This conclusion reflects the evidence presented, but the reliability is unclear due to lack of quality assessment.

Authors’ objectives
To assess the effect of subglottic drainage of secretions on the incidence of ventilated associated pneumonia in adult intensive care patients.

Searching
MEDLINE, EMBASE and CINAHL were searched to January 2011 for relevant articles; search terms were reported. It appeared that no language restrictions were applied. Reference lists of retrieved studies were also examined.

Study selection
Randomised controlled trials (RCTs) of subglottic drainage of secretions compared to usual care (no drainage) in adult mechanically ventilated intensive care unit patients were eligible for inclusion. The incidence of ventilator associated pneumonia had to be reported. Other outcomes of interest were intensive care unit and hospital mortality, and duration of mechanical ventilation.

Settings included joint medical-surgical intensive care units and specialist cardiothoracic units. The definition of ventilator associated pneumonia varied between trials. Most trials used cultures to confirm suspected cases of ventilator assisted pneumonia. Methods used to drain subglottic secretion ranged from intermittent aspiration with a syringe to continuous low-wall suction. Most trials included patients who received some form of stress ulcer prophylaxis and most reported some antibiotic use. Trials were published between 1992 and 2010 and conducted in France, Spain, China and the Netherlands, where reported.

The authors did not state how many reviewers selected studies for inclusion.

Assessment of study quality
The authors did not formally assess study quality.

Data extraction
Relative risks were calculated for dichotomous outcomes and mean differences for continuous outcomes together with corresponding 95% confidence intervals. The authors did not state how many reviewers extracted data.

Methods of synthesis
Pooled relative risks and weighted mean differences were calculated using a fixed-effect model unless there was evidence of statistical heterogeneity, in which case a random-effects model was used. Statistical heterogeneity was assessed using $I^2$; p value $<0.1$ represented evidence of heterogeneity. Subgroup analyses were conducted including only patients who required mechanical ventilation for at least 48 hours. Publication bias was assessed by funnel plots and Egger’s test.

Results of the review
Nine RCTs (2,277 patients) were included in the analysis.

Compared to usual care, subglottic drainage of secretions reduced the risk of ventilator associated pneumonia by 48% (RR 0.52, 95% CI 0.42 to 0.65; nine RCTs). There were no significant differences between groups for intensive care unit mortality (four RCTs) or for hospital mortality (four RCTs).
Subglottic drainage did not significantly reduce the number of days on mechanical ventilation (WMD -1.04 days, 95% CI -2.79 to 0.71; six RCTs). Although subgroup analyses including only patients thought to require mechanical ventilation for at least 48 hours reported a significant reduction in number of days on mechanical ventilation (WMD 2.0 days, 95% CI 1.6 to 2.3 days); the number of RCTs for this analysis was not reported.

Increased time to ventilator associated pneumonia was reported for subglottic drainage compared to usual care (WMD 2.89, 95% CI 0.09 to 5.69; eight RCTs).

Significant statistical heterogeneity was found for the number of days on mechanical ventilation and time to ventilator associated pneumonia (data not reported).

**Authors’ conclusions**
Almost half of cases of ventilator associated pneumonia may be prevented with the use of specialized endotracheal tubes designed to drain subglottic secretions. Time on mechanical ventilation may be reduced and time to development of ventilator associated pneumonia may be increased, but no reduction in intensive care unit or hospital mortality was observed.

**CRD commentary**
The review question was clear with defined inclusion criteria. Some relevant sources were searched, and it appeared that efforts to reduce language bias were taken, though it was unclear whether similar efforts were made to reduce publication bias. The authors did not report whether appropriate steps were taken to reduce reviewer error or bias, though the methods of analysis appeared appropriate.

Subglottic drainage consistently reduced the rate of ventilator associated pneumonia across all the included studies, so the authors’ conclusions on this point reliably reflected the available evidence. However, the lack of quality assessment meant it was unclear whether the results of these studies were biased.

The authors’ conclusion regarding time on mechanical ventilation and time to development of ventilator associated pneumonia were based on inconsistent evidence of unknown quality, so may not be reliable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that future research (using sufficiently large samples) was needed to assess the benefit of subglottic drainage in all ventilated intensive care unit patients, not just those considered to require mechanical ventilation for at least 48 hours.

**Funding**
Not stated.

**Bibliographic details**

**PubMedID**
23583261

**DOI**
10.1016/j.aucc.2013.03.003

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Critical Care/methods; Drainage/instrumentation; Equipment Design; Glottis; Humans; Intensive Care Units;
Intubation, Intratracheal /instrumentation; Pneumonia, Ventilator-Associated /prevention & control; Respiration, Artificial /adverse effects

AccessionNumber
12013020779

Date bibliographic record published
02/05/2013

Date abstract record published
19/11/2013

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.