Systematic review and meta-analysis of studies of the timing of tracheostomy in adult patients undergoing artificial ventilation

Griffiths J, Barber V S, Morgan L, Young J D

CRD summary
This review compared early and late tracheostomy in patients undergoing prolonged artificial ventilation. The authors concluded that performing a tracheostomy earlier may shorten the duration of artificial ventilation and length of stay in the intensive care unit. The lack of methodological detail, the limited number of studies included in the review, and the clinical and statistical heterogeneity identified, mean that the conclusions and implications for practice may not be reliable.

Authors' objectives
To compare the outcomes of early and late tracheostomy in critically ill patients undergoing artificial ventilation.

Searching
MEDLINE, CINAHL, EMBASE, the Cochrane CENTRAL Register, the National Research Register, the NHS Trusts Clinical Trials Register, a Medical Research Council (UK) database, the NHS Research and Development Health Technology Assessment Programme and the British Heart Foundation database were searched up to November 2004; details of the search terms and strategies were not reported. The bibliographies of reports of RCTs and reviews were checked, and experts in the UK were contacted. The authors stated that two of the authors conducted the electronic searches in duplicate and then repeated them independently.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) and quasi-RCTs were eligible for inclusion.

Specific interventions included in the review
Studies of patients that had an early tracheostomy (defined as within 7 days of admission) compared with either continued translaryngeal intubation or translaryngeal intubation followed by late tracheostomy were eligible. In the included studies, the delay between admission and tracheostomy in the intervention group ranged from 0 to 7 days. The comparator groups had either prolonged translaryngeal intubation, or a tracheostomy between 8 and 16 days after admission.

Participants included in the review
Studies of adults requiring artificial ventilation in an intensive care unit were eligible. The included studies had been carried out in a head injury unit, trauma unit, surgical unit, medical unit and a burns unit.

Outcomes assessed in the review
The inclusion criteria were not clearly specified in terms of outcomes. The primary outcome measure was mortality, although this was not reported in all included studies. Studies reporting secondary outcomes, such as the length of stay, duration of artificial ventilation and incidence of ventilator-associated pneumonia, were also included.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The review was restricted to RCTs and quasi-RCTs, and the authors stated that the included studies were methodologically sound. However, details of how the validity of the included studies was assessed were not reported.
The authors did not state how the papers were assessed for validity, or how many reviewers performed the validity assessment.

**Data extraction**
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Hospital and 30-day mortality were combined in the analysis. If the time point for mortality data was not given, it was assumed to be hospital mortality.

**Methods of synthesis**
How were the studies combined?
The results of the primary studies were pooled in a meta-analysis. Pooled relative risks (RRs) for binary variables and weighted mean differences (WMDs) for continuous variables were calculated, along with 95% confidence intervals (CIs), using a random-effects model.

How were differences between studies investigated?
Heterogeneity was investigated using the chi-squared and I² statistics. An I² of greater than 50% was deemed to indicate significant heterogeneity.

**Results of the review**
Five studies (n=406) were included in the review. The review included two 'true' RCTS, two quasi-RCTs and one RCT where the method of randomisation was not reported.

The pooled estimates reported for difference in mortality (4 studies) and for hospital-acquired pneumonia (5 studies) did not indicate a statistically significant effect of the timing of the tracheostomy.

The pooled estimate indicated that early tracheostomy resulted in a statistically significant reduction in the duration of artificial ventilation (4 studies; WMD -8.49, 95% CI -15.32, -1.66).

The pooled estimate indicated that early tracheostomy resulted in a statistically significant reduction in length of stay in the intensive care unit (2 studies; WMD -15.33, 95% CI -24.58, -6.08). As both primary studies found that early tracheostomy resulted in a statistically significant reduction for this outcome, the size of the pooled effect may be unreliable, but the direction and significance of the effect were not.

Heterogeneity for all pooled estimates was considered significant, with a very high degree of heterogeneity found for some analyses. The I² statistic ranged from 57.8 to 86.9%. It was therefore questionable whether the study results should have been pooled, and whether the pooled estimates reported were valid.

**Authors' conclusions**
Performing an earlier tracheostomy in patients who require prolonged mechanical ventilation may shorten the duration of artificial ventilation and length of stay in the intensive care unit.

**CRD commentary**
The review question and inclusion criteria were clearly stated. The authors carried out an extensive search, with attempts to locate published and unpublished data, thus minimising the possibility of publication bias. They stated that the searches were performed in duplicate but, as it was unclear whether the study selection and data extraction processes were also carried out in duplicate, error and bias could not be ruled out. The authors seemed to have assessed study quality, but they did not report the criteria used or the results of the assessment for each included study.

Appropriate measures of effect were calculated. Owing to the lack of details on the review methodology, the limited number of studies included in the review, and the clinical and statistical heterogeneity identified, the conclusions and
Implications for practice may not be reliable.

Implications of the review for practice and research
Practice: The authors stated that a tracheostomy placed earlier in the proceedings than was currently practised may be advisable.

Research: The authors did not state any implications for further research.

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Other publications of related interest
This additional published commentary may also be of interest. Sinuff T. Review: early tracheostomy is not better than late tracheostomy for reducing all-cause mortality in critically ill patients. ACP J Club 2005;143:62.

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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.