Closed tracheal suction systems for prevention of ventilator-associated pneumonia
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CRD summary
This review concluded that closed tracheal suction systems were not associated with lower incidence of ventilator-associated pneumonia, mortality or length of intensive care unit stay of mechanically ventilated patients when compared with open tracheal suction systems. Overall, this was a well-conducted review, but the included trials had methodological limitations which might affect the reliability of the authors' conclusions.

Authors' objectives
To assess the comparative effectiveness of closed and open tracheal suction systems for the prevention of ventilator-assisted pneumonia in critically-ill patients.

Searching
The authors searched PubMed up to September 2007 and the Cochrane Central Register of Controlled Trials (CENTRAL). Search terms were reported. References of selected articles were explored. RCTs needed to be written in English, French or German to be included.

Study selection
To be eligible for the review, studies had to be randomised controlled trials (RCTs) that examined the role of closed tracheal suction systems compared with open systems for the management of ventilator-associated pneumonia in critically-ill adults. The incidence of ventilator-assisted pneumonia (primary outcome) had to be reported and measured until the patient's death or discharge from the intensive care unit. To be considered as ventilator-associated, findings of pneumonia needed to be present in patients receiving mechanical ventilation for at least 48 hours. All-cause mortality, length of ICU stay, duration of mechanical ventilation, colonisation of the respiratory tract and costs were secondary outcomes. Trials focusing on special issues of endotracheal suctioning were excluded, as were trials that compared different types of closed tracheal suction systems and trials with outcomes relating only to gas exchange and haemodynamics.

In most included trials, diagnosis of ventilator-assisted pneumonia was by clinical, laboratory and imaging findings. Most trials replaced the catheter of the closed tracheal suction systems every 24 hours, with a minority of included trials reporting changing the catheter when it was grossly contaminated with secretions or its integrity was disrupted. Brands of closed tracheal systems included Hi-Care, Steri-Cath and TrachCare.

It appeared that two reviewers were involved in the selection of studies for the review.

Assessment of study quality
Two reviewers independently scored the quality of each RCT using the Jadad scale, which assessed randomisation procedures, blinding and withdrawals, with a maximum possible score of 5 points.

Data extraction
Two reviewers independently extracted data from all eligible articles and resolved any disagreements by consensus.

Methods of synthesis
Outcomes from RCTs were pooled in meta-analyses. For continuous outcomes, weighted mean differences (WMD) and 95% confidence intervals (CI), and for binary outcomes, odds ratios (OR) and 95% confidence intervals, were pooled separately using random-effects models. Heterogeneity was assessed using the X² and the I² statistics. Publication bias was assessed using a funnel plot.

Results of the review
Nine RCTs were included in the review (n=1,292 participants; range 20 to 457). Five trials scored 1 point on the Jadad
quality scale, and four trials scored 2 points.

There was no statistically significant difference in incidence of ventilator-assisted pneumonia between closed and open tracheal suction systems, and no evidence of statistical heterogeneity (nine trials). No publication bias was identified. Further subgroup analyses did not change this finding.

There was no statistically significant difference between closed or open tracheal suction systems in terms of mortality (five trials) and length of intensive care unit stay (two trials). Suctioning with closed tracheal suction systems was associated with longer mechanical ventilation duration than open tracheal suction systems (WMD 0.65 days, 95% CI 0.28 to 1.03; five trials). The respiratory tracts of more patients were colonised in the group that received closed tracheal suction systems than those that received open tracheal suction systems (OR 2.88, 95% CI 1.50 to 5.52; four trials).

**Cost information**

Two trials reported that closed tracheal suction systems had a higher cost than open tracheal suction systems, whilst two showed no difference.

**Authors’ conclusions**

Closed tracheal suction system usage did not provide any benefit on ventilator-assisted pneumonia incidence, mortality or intensive care unit stay of mechanically ventilated patients.

**CRD commentary**

This review was based on defined inclusion criteria. Searching was performed on two relevant databases, with examination of references. The exclusion of papers in selected foreign languages may have led to studies being missed. Procedures were put in place to minimise bias and error in the review process.

Trial quality was assessed and details of the included trials were presented. The meta-analyses appeared to be appropriate. The authors assessed the possibility of heterogeneity and publication bias.

Overall, this was a well-conducted review, but it should be noted that the included trials had methodological limitations which might affect the reliability of the authors’ conclusions.

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

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

**Research:** The authors recommended further investigation into the role of closed tracheal suction systems in decreasing environmental spread of multi-drug resistant pathogens.

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