

Toothbrushing may reduce ventilator-associated pneumonia

Abstracted from

Alhazzani W, Smith O, Muscedere J, Medd J, Cook D.

Toothbrushing for critically ill mechanically ventilated patients: a systematic review and meta-analysis of randomized trials evaluating ventilator-associated pneumonia.

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Question: In mechanically ventilated critically ill adults does oral care using a toothbrush reduce the occurrence of ventilator-associated pneumonia (VAP)?

Data sources The databases Embase, Medline, CINAHL, the Cochrane Central Register of Controlled Trials, the Cochrane Database of Systematic Reviews, clinical trials.gov and controlled-trials.com were searched. Reference lists of reviewed articles and eligible trials were also searched, and toothpaste and toothbrush manufactures were contacted.

Study selection Randomised controlled trials in adults over 18 years receiving mechanical ventilation were included where any kind of oral care involving toothbrushing was compared with any other kind of oral care or control with or without toothbrushing.

Data extraction and synthesis Data were extracted in duplicate and quality assessed using the Cochrane risk of bias tool. The results were combined using a random effects model. The main outcome was VAP.

Results Six trials involving a total of 1408 patients were included. The risk of bias was high in four trials, low in one and unclear in the other. In four trials, there was a trend toward lower ventilator-associated pneumonia rates (risk ratio, 0.77; 95% confidence interval, 0.50-1.21; $p = 0.26$). The only trial with low risk of bias suggested that toothbrushing significantly reduced ventilator-associated pneumonia (risk ratio, 0.26; 95% confidence interval, 0.10-0.67; $p = 0.006$). Use of chlorhexidine antiseptics seems to attenuate the effect of toothbrushing on ventilator-associated pneumonia (p for the interaction = 0.02). One trial comparing electric vs. manual toothbrushing showed no difference in ventilator-associated pneumonia rates (risk ratio, 0.96; 95% confidence interval, 0.47-1.96; $p = 0.91$). Toothbrushing did not impact on length of ICU stay, or ICU or hospital mortality.

Conclusions In summary, randomised trials to date show that toothbrushing is associated with a trend toward lower rates of VAP in intubated, mechanically ventilated critically ill patients. There is no clear difference between electric and manual toothbrushing. Toothbrushing has no effect on ICU mortality, hospital mortality, or ICU length of stay

Commentary

Ventilator associated pneumonia, known as VAP, is one of the commonest acquired infections in patients receiving mechanical ventilation in intensive care units (ICU).¹ Data from the US have demonstrated that the incidence of VAP varies between 9-27%.² There are no VAP incidence data for the UK. Progression to VAP depends on a number of factors including: duration of mechanical ventilation, other medical conditions, medication, immunosuppression and intubation with naso- or oro-gastric tubes.³

There are a number of prevention strategies that have been implemented, using a bundle approach which includes: elevation of the head of the bed to 30-45 degrees, DVT prophylaxis, gastric ulcer prophylaxis, humidification of inspired gas, appropriate tubing management, suctioning of respiratory secretions and routine oral hygiene.⁴

A number of RCTs have implemented different regimens of oral hygiene care including using toothettes/swabs with chlorhexidine, manual toothbrushes and powered toothbrushes, in order to reduce the bacterial load within dental plaque and the oral mucosa. The results from these RCTs have been conflicting, in terms of reduction in incidence of VAP.

A systematic review was carried out by Alhazzani W. et al. in 2013 to evaluate the effectiveness of oral care using toothbrushing in mechanically ventilated patients to reduce the incidence of VAP.

The review addressed a clearly focussed issue, identifying:

- the population as adult mechanically ventilated patients
- the intervention given as oral care with tooth brushing
- the outcomes as the incidence of VAP.

The authors mainly included RCTs, which addresses the review question of evaluating an intervention with an appropriate study design. However, they could have also included pseudo-randomised RCTs, in order to increase the number of studies, which could have potentially been included in the review at the initial stages.

The authors searched seven bibliographic databases as well as websites on clinical trials, which gave a comprehensive search for RCTs both in published and unpublished literature. Furthermore, they included all languages, thereby reducing the risk of language bias in publications. The only limitation was that they did not have personal contact with experts.

The authors had defined the eligibility criteria; however, the definition of VAP was unclear.

The review included a comprehensive assessment for risk of bias using the Cochrane Collaboration Tool.

The results included four studies, which were clearly displayed and showed similar results except for one outlier. The studies were combined for meta-analysis and there was some evidence of heterogeneity. This was expected, as different studies employed different methodologies, different samples and age groups of patients and variation in the spectrum of critical care. These factors could have contributed to clinical and statistical heterogeneity. The authors dealt with heterogeneity by carrying out sensitivity analyses, as a priori to exclude trials at high risk of bias. They also carried out a subgroup analysis comparing trials which employed chlorhexidine with tooth brushing vs. those who had not.

The combined risk ratio was 0.77 (CI 0.50, 1.21). This meant that the risk of developing VAP decreased by 23% if oral care was provided for mechanically ventilated patients. However, this result was statistically not significant, as it crossed the line of no effect. This could be due to different studies comparing different forms of oral care. The authors have identified the limitations to this systematic review including; the small number of trials included, the variable definition of VAP and the statistical heterogeneity. The authors also recognised that more robust evidence was needed.

Acquiring VAP could be fatal, with an associated mortality of 46%, as well as an increase in the length of hospital stay.² Implementing oral health care regimens is a simple intervention that may potentially decrease the bacterial load and thereby decreasing the risk of VAP. There needs to be a balance between cost, time taken to deliver an oral care intervention and the benefits gained by patients. It is therefore important to deliver oral care to mechanically ventilated patients not only to maintain their oral health status, but also to preserve their dignity.

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