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[Intervention Review]

Oral hygiene care for critically ill patients to prevent ventilatorassociated pneumonia

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ABSTRACT

Background

Ventilator-associated pneumonia (VAP) is defined as pneumonia developing in people who have received mechanical ventilation for at least 48 hours. VAP is a potentially serious complication in these patients who are already critically ill. Oral hygiene care (OHC), using either a mouthrinse, gel, toothbrush, or combination, together with aspiration of secretions, may reduce the risk of VAP in these patients.

Objectives

To assess the effects of oral hygiene care on incidence of ventilator-associated pneumonia in critically ill patients receiving mechanical ventilation in hospital intensive care units (ICUs).

Search methods

We searched the following electronic databases: Cochrane Oral Health's Trials Register (to 17 December 2015), the Cochrane Central Register of Controlled Trials (CENTRAL) (the Cochrane Library, 2015, Issue 11), MEDLINE Ovid (1946 to 17 December 2015), Embase Ovid (1980 to 17 December 2015), LILACS BIREME Virtual Health Library (1982 to 17 December 2015), CINAHL EBSCO (1937 to 17 December 2016), Chinese Biomedical Literature Database (1978 to 14 January 2013), China National Knowledge Infrastructure (1994 to 14 January 2013), Wan Fang Database (January 1984 to 14 January 2013) and VIP Database (January 2012 to 4 May 2016). We searched ClinicalTrials.gov and the World Health Organization International Clinical Trials Registry Platform for ongoing trials to 17 December 2015. We placed no restrictions on the language or date of publication when searching the electronic databases.

Selection criteria

We included randomised controlled trials (RCTs) evaluating the effects of OHC (mouthrinse, swab, toothbrush or combination) in critically ill patients receiving mechanical ventilation for at least 48 hours.

Data collection and analysis

At least two review authors independently assessed search results, extracted data and assessed risk of bias in included studies. We contacted study authors for additional information. We pooled data from trials with similar interventions and outcomes. We reported risk

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ratio (RR) for dichotomous outcomes and mean difference (MD) for continuous outcomes, using random-effects models unless there were fewer than four studies.

Main results

We included 38 RCTs (6016 participants). There were four main comparisons: chlorhexidine (CHX) mouthrinse or gel versus placebo/usual care; toothbrushing versus no toothbrushing; powered versus manual toothbrushing; and comparisons of oral care solutions. We assessed the overall risk of bias as low in five trials (13%), high in 26 trials (68%), and unclear in seven trials (18%). We did not consider the risk of bias to be serious when assessing the quality of evidence (GRADE) for VAP incidence, but we downgraded other outcomes for risk of bias.

High quality evidence from 18 RCTs (2451 participants, 86% adults) shows that CHX mouthrinse or gel, as part of OHC, reduces the risk of VAP compared to placebo or usual care from 24% to about 18% (RR 0.75, 95% confidence intervals (CI) 0.62 to 0.91, P = 0.004, $I^2 = 35\%$). This is equivalent to a number needed to treat for an additional beneficial outcome (NNTB) of 17 (95% CI 9 to 50), which indicates that for every 17 ventilated patients in intensive care receiving OHC including chlorhexidine, one outcome of VAP would be prevented. There is no evidence of a difference between CHX and placebo/usual care for the outcomes of mortality (RR 1.09, 95% CI 0.96 to 1.23, P = 0.20, $I^2 = 0\%$, 14 RCTs, 2014 participants, moderate quality evidence), duration of mechanical ventilation (MD -0.09 days, 95% CI -1.73 to 1.55 days, P = 0.91, $I^2 = 36\%$, five RCTs, 800 participants, low quality evidence), or duration of intensive care unit (ICU) stay (MD 0.21 days, 95% CI -1.48 to 1.89 days, P = 0.81, $I^2 = 9\%$, six RCTs, 833 participants, moderate quality evidence). There is insufficient evidence to determine the effect of CHX on duration of systemic antibiotics, oral health indices, caregivers' preferences or cost. Only two studies reported any adverse effects, and these were mild with similar frequency in CHX and control groups.

We are uncertain as to the effects of toothbrushing (\pm antiseptics) on the outcomes of VAP (RR 0.69, 95% CI 0.44 to 1.09, P = 0.11, I² = 64%, five RCTs, 889 participants, very low quality evidence) and mortality (RR 0.87, 95% CI 0.70 to 1.09, P = 0.24, I² = 0%, five RCTs, 889 participants, low quality evidence) compared to OHC without toothbrushing (\pm antiseptics). There is insufficient evidence to determine whether toothbrushing affects duration of mechanical ventilation, duration of ICU stay, use of systemic antibiotics, oral health indices, adverse effects, caregivers' preferences or cost.

Only one trial (78 participants) compared use of a powered toothbrush with a manual toothbrush, providing insufficient evidence to determine the effect on any of the outcomes of this review.

Fifteen trials compared various other oral care solutions. There is very weak evidence that povidone iodine mouthrinse is more effective than saline/placebo (RR 0.69, 95% CI 0.50 to 0.95, P = 0.02, I² = 74%, three studies, 356 participants, high risk of bias), and that saline rinse is more effective than saline swab (RR 0.47, 95% CI 0.37 to 0.62, P < 0.001, I² = 84%, four studies, 488 participants, high risk of bias) in reducing VAP. Due to variation in comparisons and outcomes among trials, there is insufficient evidence concerning the effects of other oral care solutions.

Authors' conclusions

OHC including chlorhexidine mouthwash or gel reduces the risk of developing ventilator-associated pneumonia in critically ill patients from 24% to about 18%. However, there is no evidence of a difference in the outcomes of mortality, duration of mechanical ventilation or duration of ICU stay. There is no evidence that OHC including both antiseptics and toothbrushing is different from OHC with antiseptics alone, and some weak evidence to suggest that povidone iodine mouthrinse is more effective than saline/placebo, and saline rinse is more effective than saline swab in reducing VAP. There is insufficient evidence to determine whether powered toothbrushing or other oral care solutions are effective in reducing VAP. There is also insufficient evidence to determine whether any of the interventions evaluated in the studies are associated with adverse effects.

PLAIN LANGUAGE SUMMARY

Oral hygiene care for critically ill patients to prevent ventilator-associated pneumonia

Review question

What are the effects of oral hygiene care on the incidence of ventilator-associated pneumonia in critically ill patients receiving mechanical ventilation in hospital intensive care units (ICUs)? We aimed to summarise all the available appropriate research in order to identify evidence-based care for these vulnerable patients.

Background

Critically ill people, who may be unconscious or sedated while they are treated in ICUs, often need to have machines to help them breathe (ventilators). The use of these machines for more than 48 hours may result in ventilator-associated pneumonia (VAP). VAP is a potentially serious complication in these patients who are already critically ill.

Oral hygiene care, using a mouthrinse, gel, toothbrush, or combination, together with suctioning secretions, may reduce the risk of VAP in these patients.

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Study characteristics

This review of studies was carried out through Cochrane Oral Health, and the evidence is current up to 17 December 2015.

We included 38 research studies but only a few (13%) of the studies were well conducted and described.

All of the studies took place in ICUs in hospitals. In total there were 6016 participants randomly allocated to treatment. Participants were critically ill and required assistance from nursing staff for their oral hygiene care. Most of the studies involved adults only, but the participants were children in three of the studies, and newborns in one study.

We grouped studies into four main comparisons.

1. Chlorhexidine antiseptic mouthrinse or gel compared to placebo (treatment without the active ingredient chlorhexidine) or usual care, (with or without toothbrushing)

- 2. Toothbrushing compared with no toothbrushing (with or without antiseptics)
- 3. Powered compared with manual toothbrushing
- 4. Oral care solutions with other solutions

Key results

We found high quality evidence that chlorhexidine, either as a mouthrinse or a gel, reduces the risk of VAP from 24% to about 18%. For every 17 people on ventilators for more than 48 hours in intensive care, the use of oral hygiene care including chlorhexidine will prevent one person developing VAP. However, we found no evidence that oral hygiene care with chlorhexidine makes a difference to the numbers of patients who die in ICU, or to the number of days on mechanical ventilation or days in ICU.

We have only limited evidence on the effects of toothbrushing (with or without antiseptics) and oral care without toothbrushing (with or without antiseptics) on the risk of developing VAP. Three studies showed some weak evidence of a reduction in VAP with povidone iodine antiseptic mouthrinse compared to placebo/saline. Four studies showed some weak evidence of a reduction in VAP with saline rinse compared to saline swab.

There was insufficient evidence to determine whether any of the interventions evaluated in the studies are associated with any unwanted side effects.

Quality of the evidence

The evidence presented was limited by how well the included studies were done and reported. Only 13% of the studies were well conducted and well described. For a number of outcomes, there was not enough information to draw a solid conclusion.