



Oral Care in Intubated Patients Weather or not on Mechanical Ventilation: A Systemic Review

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Abstract

Oral care is an important part of nursing management in intubated patients as it affects both wellness and clinical outcomes of intensive care patients. Many of the intubated patients develop nosocomial pneumonia (ventilator associated pneumonia/VAP when on mechanical ventilation) owing to invasion by oropharyngeal microorganisms in intensive care patients. So Intensive care intubated patients need proper oral assessment and oral care to avoid complications caused by oro-pharyngeal bacteria. In this systemic review we aimed to determine the standard practice guidelines over oral hygiene intubated patients in intensive care unit. For the purpose of collection of data we searched extensively on internet databases including Pub Med, Med know, Google scholar and EBSCO HOST. The keywords used were oral care, oral hygiene practice, mouth care, mouth hygiene, intubated, mechanical ventilation, intensive care and critical care. We analyzed the studies which were performed on adult intensive care intubated patients, published in peer-reviewed indexed journals and preferably done by nursing officers.

Type of studies we analyzed in this systemic review were descriptive evaluation studies, randomised controlled trials, literature review and meta-analysis & randomized clinical trials. After the analysis of all study articles we concluded that oral brushing with chlorhexidine solution in various strength (0.12%, 0.2%, 2%) at least twice a day can reduce the incidence of VAP in intensive care intubated patients.

Keywords: *Intensive care, oral care, Ventilator associated pneumonia, intubated patient.*

Introduction

Patients in intensive care units are intubated mainly to put them on mechanical ventilation but sometimes elective intubation is also done to protect from aspiration when airway reflexes are

lost. Oral care is an important part of nursing management in intubated patients as it affects both wellness and clinical outcomes of intensive care patients¹⁻⁴. Many of the intubated patients develop nosocomial pneumonia (ventilator associated

pneumonia/VAP when on mechanical ventilation) owing to invasion by oropharyngeal microorganisms in intensive care patients⁵. Infections involving the lungs are the most common nosocomial infections in ICU patients, accounting for 65% of all nosocomial infections in this patient population⁶. Over 90% of ICU-acquired pneumonia occurs during mechanical ventilation, and 50% of these VAPs begin in the first 4 days after intubation⁷. VAP is a common type of nosocomial infections prolonging the hospital stay duration, increasing costs and mortality in ICU patients on ventilator^{8,9}. In United States, VAP is ranked second among nosocomial infections¹⁰. Oral care when done properly as a part of daily routine nursing care can decrease VAP incidence¹¹ to significant extent.

Aspiration of oral secretions colonized by microorganisms to lower respiratory tract is the most important mechanism in development of VAP. So, reducing the number of oral microorganisms may have an important effect in the prevention of VAP¹²⁻¹⁵.

Tooth plaques are important source of bacterial growth that causes organismal adherence over tooth surface. Anaerobic and Gram (-) bacteria proliferated within 2 days causes changes in oral flora and plaque development in teeth in the form of biofilm which may also spread through subgingival area. Micro-colonization can be prevented by Systemic antibiotics and local antimicrobial drugs. Direct extraction of plaque can damage gingiva and teeth¹⁶. Various studies concluded that reducing the number of oral bacteria with oral care decreases translocation, respiratory colonization, and consequently chances of VAP¹⁷.

Although there are guidelines for oral hygiene in chemotherapy patients, there are no uniform guidelines for oral care practice in intubated patients. In this systemic review, we tried to unify the current recommendations and practices over oral hygiene in intubated patients in intensive care unit.

Review of Literature

We have done extensive review of literatures available on oral care in intubated patients the references of which are quoted at various places in this study. Grap MJ et al 2003 explained about oral care intervention in critical care¹. Grap MJ et al 2004 described about the duration of action of a single, early oral application of chlorhexidine on oral microbial flora in mechanically ventilated patients². Berry AM et al 2011 gave consensus based clinical guideline for oral hygiene in the critically ill⁵. Vincent J-L et al 2009 studied the prevalence and outcomes of infection in intensive care units⁶.

Need of study

The study was aimed to review the most recent studies conducted in the area of mouth care among intubated patients either or not on mechanical ventilation and intended to help nurses to make more effective decisions about mouth care in these patients. We tried to unify the current recommendations and practices over oral hygiene in intubated patients in intensive care unit

Methods

For the purpose of collection of data we searched extensively on internet databases including Pub Med, Med know, Google scholar and EBSCO HOST. The keywords used were oral care, oral hygiene practice, mouth care, mouth hygiene, intubated, mechanical ventilation, intensive care and critical care.

We analyzed the studies which were performed on adult intensive care intubated patients, published in peer-reviewed indexed journals and preferably done by nursing officers.

Type of studies we analyzed in this systemic review were:

- a. Descriptive evaluation studies
- b. Randomised controlled trials
- c. Literature review
- d. Meta-analysis and randomized clinical trials

We tried to explore every article for the following questions:

- a. What are the instruments used for oral examination in intensive care intubated patients?
- b. What are the oral care solutions used in intensive care unit patients?

- c. What are the oral care materials used in intensive care patients?
- d. How frequent are the intensive care unit patients performed oral care?

Results

We would like summarize here some of the studies in brief and in tabular form.

Table 1: Descriptive evaluation studies

Investigator	Grap et al. (2003) ¹	DeKeyser Ganz et al. (2009) ¹⁸	Rello et al. (2007) ¹⁹	Feider et al. (2010) ²⁰
Oral assessment tools	Unspecified	71% nurse performed an oral assessment before beginning oral care but, none could describe what assessment tool was used	Unspecified	93% nurses they did not mention any standard form for oral examination. Nurses evaluated for oral; 94% bleeding, 87% oral mucosal tears, ulcerations, abrasions or cracks, 85% dry mouth, 84% tissue color, 81% redness, 69% swelling
Oral care solution	Chlorhexidine, isotonic sodium chloride, hydrogen peroxide mixture	75% chlorhexidine	61% chlorhexidine	61% chlorhexidine gluconate 24% hydrogen peroxide, 21% normal salina, 19% lemon glycerin swab
Oral care materials	Foam swab	84% gauze ped 34% toothbrush	22% foam swabs 42% moisture agents, 41% manual toothbrushes	97% foam swabs
Oral care practice frequency	5 times a day	Unspecified	20% once daily, 31% twice or 37% three times	50 % every 2 hours, 42 % every 4 hours.

In most of the studies the investigator didn't mentioned any oral assessment tool except for Feider et al. (2010) who evaluated for oral bleeding, oral mucosal tears, ulcerations, abrasions or cracks, dry mouth, tissue color,

redness, swelling in different proportions. Chlorhexidine was the most preferred solution used by nursing officers. Preferred oral care materials were foam swabs, cotton with forceps and tooth brush.

Table 2: Randomised controlled trials

Investigator	Houston et al. (2002) ²¹	Munro et al. (2009) ²²	Yao et al. (2011) ²³
Oral assessment tools	Unspecified	Unspecified	Unspecified
Intervention	Experimental group; peridex (0.12% chlorhexidine gluconate), 2 times daily, Control group; listerine (phenolic mixture), 2 times daily	I. group; 0.12% solution chlorhexidine oral swab twice daily II. group; toothbrushing thrice daily III. group; both toothbrushing and chlorhexidine IV. group; usual care	Experimental group; received a twice-daily oral care protocol of toothbrushing with purified water, Control group; usual hospital care, that is, daily oral care using cotton swabs

Results	The overall rate of nosocomial pneumonia was reduced by 52% in the peridex-treated patients. Among patients intubated for more than 24 hours who had cultures that showed microbial growth (all pneumonias occurred in this group), the pneumonia rate was reduced by 58% in patients treated with peridex. In patients at highest risk for pneumonia, the rate was 71% lower in the peridex group than in the listerine group.	Among patients without pneumonia at baseline, pneumonia developed in 24% by day 3 in those treated with chlorhexidine. When data on all patients were analyzed together, mixed models analysis indicated no effect of either chlorhexidine (P = 0.29) or toothbrushing (P = 0.95). However, chlorhexidine significantly reduced the incidence of pneumonia on day 3 (CPIS ≥6) among patients who had CPIS <6 at baseline (P = 0.006). Toothbrushing had no effect on CPIS and did not enhance the effect of chlorhexidine.	After 7 days of toothbrushing with purified water, cumulative VAP rates were significantly lower in the experimental (17%) than in the control (71%) group. The experimental group also had significantly better scores for oral health (P <0.05) and plaque index (P <0.01).
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Most of the studies emphasized on an important role of chlorhexidine solution in variable concentrations in prevention of VAP development.

Table 3: Literature review

Authors	Halm MA, Armola R (2009) ²⁴ (Seven randomized controlled trials from diverse ICUs)	Roberts and Moule (2011) ²⁵ Eight studies that met the criteria and addressed the study aims were reviewed.	Goss et al. (2011) ²⁶ A retrospective record review (between July 1, 2007 and December 31, 2007)	Dale et al. (2012) ²⁷ Between 1960 and 2011, 84 papers met all of the inclusion criteria.
Review type	Only randomized controlled trials	Literature review	A retrospective record review	Literature review
Results	Oral care interventions were mechanical (toothbrushing) or pharmacological (chlorhexidine 0.12%–2%, 2% colistin, or a combination of the 2) delivered via rinse, swab, gel, or paste. Frequency ranged from every 2 hours to 2, 3, or 4 times a day. Measures included dental plaque scales, oral cultures scores, bacterial cultures, clinical pulmonary infection scores, and CDC diagnostic criteria for infections of the lower part of the respiratory tract (eg, fever, leukocytosis, pulmonary infiltrates).	Results of studies investigating the use of toothbrushing in reducing VAP incidence proved inconsistent, although all recommend toothbrushing as important in maintaining good oral hygiene	Study found that although oral care is a Center for Disease Control and Prevention (CDC) recommendation for the prevention of hospital-associated infections like Ventilator-Associated Pneumonia (VAP), indication of documentation of the specifics are lacking in the patients' medical record.	Oral care originally focused on patient comfort within the literature; now it is emphasized as an infection control practice for the prevention of Ventilator-Associated Pneumonia (VAP). Despite concern for its neglected application, the literature does not sufficiently address mouth care's practical accomplishment.

Most of the literature recommended chlorhexidine for oral care as to reduce VAP, tooth brushing with chlorhexidine can be recommended in

decreasing VAP to provide higher standard for the patients on mechanical ventilation.

Table 4: Meta-analysis and randomized clinical trials

Investigator	Chan et all (2007) ⁴ Between 1994-2006	Berolde and Andrade (2008) ²⁸ (Eight publications were analyzed)	Balamurugan et al. (2012)
Analysis type	Sistematic review and meta-analysis	Meta-analysis and randomized clinical trials	meta-analysis
conclusion	Oral decontamination of mechanically ventilated adults using antiseptics is associated with a lower risk of ventilator associated pneumonia. Neither antiseptic nor antibiotic oral decontamination reduced mortality or duration of mechanical ventilation or stay in the intensive care unit.	In seven (87.5%) chlorhexidine diminished the colonization of the oropharynx, and in four (50%) there was a reduction of VAP. Chlorhexidine seems to reduce colonization, thus reducing the incidence of VAP.	This meta-analysis indicated that chlorhexidine can serve as a cost-effective and safe antiseptic in preventing VAP in mechanically ventilated patients.

So these meta-analysis also recommended chlorhexidine as safe and cost-effective solution for oral care to reduce incidence of VAP.

Discussion

Considering the above mentioned research articles it is very much clear that efficient oral care in intubated ICU patients is crucial part of nursing management to reduce incidence of nosocomial pneumonia and to improve patient outcome. In intubated patients, oral integrity is compromised due to various mechanical reasons like nasogastric or oro-gastric tubes and endo-tracheal tube itself. Inadequate hydration or nutrition, immune breakdown, old age and prolonged ICU stay adds to the agony.

Tools used for oral examination

An standardized oral evaluation tool is necessary for assessment, planning and nursing management. However, no standard evaluation tool could be found for safety and validity in intensive care patients. Everyday a comprehensive evaluation of teeth, gingiva, tongue, mucous membranes and limbs should be done in ICU patients^{29,30}. In one of descriptive study Feider et al. (2010) evaluated for oral bleeding, oral mucosal tears, ulcerations, abrasions or cracks, dry mouth, tissue color, redness, swelling in different proportions. Other studies mentioned the importance of oral evaluation tool but could not described it in detail. Berry et al (2007) reported that improving the tools and techniques for standard oral examination is crucial not only for

research but also for evaluation of patient and practice and increase the life quality³¹.

Oral care solutions

Most of the studies recommended chlorhexidine as the solution of choice for oral care in intubated patients. A number of studies have been done to see the efficacy of chlorhexidine in this regard. Also that chlorhexidine has been tested in various concentrations like 0.12%, 0.2%, 2%. Various meta-analysis mentioned above also showed that chlorhexidine in oral care is important to decrease incidence of VAP. For instance; Cuccio at al. (2012)³², in their study, mentioned that oral care with chlorhexidine in every 6 hours prevents VAP development. Tantipong et al. (2008)⁸, concluded in his metaanalytic study that oral care with 2% chlorhexidine in patients on mechanical ventilator is an effective and safe method to prevent VAP. Bopp et al. (2006)³³ reported that using 0.12% chlorhexidine gluconate twice daily for oral hygiene in intensive care unit patients might be a strategy to decrease nosocomial pneumonia and suggested to perform supporting studies.

Hospital pipes and taps may be contaminated by microbial proliferation so it is recommended not to use tap water routinely for oral care in intensive care unit patients³⁴.

Materials used for oral care

In various studies it has been found that oral care with sponge or cotton sticks without brushing was not sufficient for plaque cleaning. Though superiority of tooth brush has been proved for removing the tooth plaques, there are studies showing that nurses still perform oral care with oral sticks.

Berry et al (2007)³¹ recommended that tooth brushing with chlorhexidine decreased oral plaque presence and VAP development.

Maria Perno Goldie (2013) proposed powered tooth brushing system as in figure 1 but there is insufficient evidence to determine whether powered tooth brushing or other oral care solutions are effective in reducing VAP³⁵.

Figure 1: powered toothbrush



Oral care frequency

Various studies have been done regarding different frequency of oral care. So there is no fixed consensus regarding it. However, tooth brushing is recommended at least twice a day as done by Berry et al (2007)³¹.

Implication

We would like to mention that oral care is an important part of nursing practice to prevent VAP in intensive care intubated patients. Though there is no standard oral evaluation tool and no clarity

on oral care practice frequency, appropriate solution and appropriate material.

Recommendation

From the systemic review of various studies it can be suggested that oral brushing with chlorhexidine solution in various strength (0.12%, 0.2%, 2%) at least twice a day can reduce the incidence of VAP in intensive care intubated patients.

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