Research Paper:

Effect of Chlorhexidine and Orthodentol Mouthwash on Oral Hygiene of Patients Who Underwent Mechanical Ventilation, Hospitalized in Intensive Care Unit

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ABSTRACT

Background: Providing oral hygiene in patients with a tracheal tube in the mouth is one of the most important tasks of nurses. This study has been conducted with the aim of comparing the effects of two mouthwash solutions (chlorhexidine and orthodentol) on the oral hygiene of patients with respiratory ventilation device and hospitalized in intensive care units.

Methods: This is a clinical trial in which 90 patients with oral tracheal tube entered the study through simple sampling method. Inclusion criteria were being insensitive to herbal compounds and aged 15-85 years. They were divided randomly into two intervention (orthodentol) and control (chlorhexidine) groups. Each group had 45 subjects. The Beck Oral Hygiene Checklist was used to collect data (before and after intervention). Data were analyzed using SPSS software.

Results: Patients in intervention and control groups were similar in terms of demographic characteristics, oral hygiene, and other characteristics. Oral hygiene in patients in both orthodentol and chlorhexidine groups had a significant improvement after intervention.

Conclusion: The comparison of orthodentol and chlorhexidine oral mucosal effects showed that oral hygiene of patients hospitalized in intensive care units was improved to a certain extent. Considering the benefits of herbal compounds, orthodentol mouthwash can be mentioned as an appropriate alternative for chlorhexidine.

1. Background

One of the basic cares provided by nurses in Intensive Care Units (ICU) is maintaining oral hygiene of the patients (Miranda et al. 2015; Safar Abadi & Ghaznavirad 2012). These patients are often fitted with a tracheal tube in mouth and undergo mechanical ventilation. Caring programs for patients in ICU aim to make the patients feel relieved and comforted (Safar Abadi & Ghaznavirad 2012). In general, patients may have poor oral hygiene, but patients with mechanical ventilation

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system and hospitalized in special units are more prone to risk and vulnerability than the rest of the patients because the tracheal tube in these patients increases the accumulation of bacteria in the oral mucosa. Taking multiple medications increases the risk of dry mouth, which affects the oral hygiene (Percival & Williams 2014). Many factors cause problems in the mouth and teeth in patients with severe disease, anesthetized patients, and patients undergoing mechanical ventilation. Long open mouth and the resulting dryness, and the use of immunosuppressive drugs and antibiotics cause inflammation of the mouth and gums, tooth decay, dental plaques, as well as infection of the tissues around the teeth (Panchabhai et al. 2009). Some studies have shown that nurses perform oral cares based on common practices and that there is no particular way to perform oral examination. Many nurses believe that oral care disturbs the patient, and thus, they have given less importance to oral care. Various reasons, such as lack of oral care, lack of awareness, and lack of scientific standards, different methods and regimes for oral care are effective in this regard (Grap & Munro 2003; Berry 2011).

Studies have shown that oral hygiene of patients in intensive units is more neglected than in any other place. A study has showed that a significant number of patients hospitalized in the ICU had poor oral hygiene status at the time of admission. Instructions published by the Center for Disease Prevention and Control on the prevention of pneumonia in hospital highlighted the preparation and implementation of a comprehensive oral care program, which included the use of an antibacterial agent in areas where patients are prone to hospital-acquired pneumonia (Browne et al. 2011; Scannapieco, Wang & Shiau 2001). Health and oral care should be considered as one of the most important parts of nursing care. There are two main ways to maintain oral hygiene and remove tooth plaque and germs: mechanical method (toothbrush) and the drug method (including antibiotics and mouthwashes) (Fourrier et al. 2000). However, certain solutions and devices such as oxygenated water and sodium bicarbonate used by nurses to care for the mouth are not desirable (Aronovitch 1997).

Chlorhexidine is a broad-spectrum antibacterial agent that affects the gram-positive and germ-negative organisms (Berry et al. 2007). This solution is highly effective in reducing microbial contamination and establishing oral hygiene. Recently, the Ortodontal Oral Mouthwash, which contains extracts of Khouzestani Savory (carvacrol), was proposed as a mouthwash (Seghatoleslami et al 2004). Khouzestani Savory is an indigenous plant of Iran, widely distributed in the northern and western parts and south of Iran. Its extract has 30% carvacrol, which is a safe and non-toxic ingredient having many antimicrobial effects. 10% solution of carvacrol obtained from Khouzestani Savory has considerable palpable effects on toothache (Farsam etal 2004; Pappen et al. 2010). Studies have shown that the Ortodontal herbal mouthwash is a natural formulation that removes almost all infectious problems and inflammation of the mouth and gums (Hashemi et al. 2012; Shafizadeh 2002). This cheap and widely available mouthwash has a high disinfection strength and causes pharyngeal disinfection; it is also safe when swallowed (Fathi et al. 2011). Given this background, the present study aimed to compare the effects of orthodentoland chlorhexidine on oral hygiene of hospitalized patients with an endotracheal tube in special units. 1. Patients with an endotracheal tube underwent mechanical ventilation in Intensive Care Unit need to care and wash their mouth to prevent pneumonia caused by mechanical ventilation 2. Now, the chlorhexidine mouthwash is used routinely (Munro et al. 2009) and, 3. The benefits of herbal compounds, and their fewer side effects than the chemical compounds.

2. Materials & Methods

For this study, the sample size was calculated based on a similar study (Adib Hajbaghery, Ansari & Azizi Fini 2011). A total of 90 anesthetized patients hospitalized in ICUs of Vali Asr (PBUH) Educational and Therapeutic Center of Boroujen and Kashani Educational and Therapeutic Center of Shahrekord were selected using simple convenient sampling. Those patients who satisfied the inclusion and exclusion criteria were then divided into intervention (45 People) and control (45 People) groups. The inclusion criteria included patients should have an endotracheal tube through the mouth, age should be 15-85 years, less than 8 hours should have passed post hospitalization and patient intubation in the ICU, should have no susceptibility to herbal compounds, absence of any specific damage by intubation or airway, and no specific lesion in the mouth. Exclusion criteria included transferring a patient from ICU or his/her death before completion of the study, creating any specific damage by intubation or airway or any other physical factor, and the reluctance of the legal guardian to continue participation in the study.

Caring and mouthwash in the intervention group were done using 10% Ortodontal Herbal mouthwash, and in the control group, it was done using 12.2% Chlorhexidine mouthwash. The number, time, and manner of mouthwash were identical in both groups. At the beginning of the study, informed consent was taken from the patient's legal guardian. Information about the patient's

basic characteristics such as history of illness, cause of hospitalization, medicines used (antibiotics), and the results of the initial assessment of oral hygiene condition were recorded in the demographic information list. Oral hygiene assessment was measured using the Beck Oral Assessment Scale (BOAS) and Oral Mucosal Plaque Score (MPS) (Safar Abadi & Ghaznavirad 2012).Validity of instruments used was evaluated by 10 faculty members of the university, and the necessary amendments were made. The researcher evaluated instrument reliability for 10 patients in ICUs. Regarding the normal distribution of checklist scores, Cronbach's alpha coefficient was used to determine the reliability; its Cronbach's alpha coefficient equaled to $\alpha = 0.862$. Oral hygiene Assessment Checklist has 5 scales (lips, mucus and gums, teeth, tongue, and saliva); each of which was divided into 4 parts and scored 1 to 4. The overall score of this instrument is 5-20. Lower score indicates oral hygiene (no problem and disorder), and the higher score shows the symptom of more severe disorder. Therefore, score 5 means no disruption, score of 6-10 means a mild impairment, score of 11-15 means average disorder, and score 16-20 means severe disorder.

3. Results

Most of the patients in the control group (chlorhexidine) were male (53.3%) and had an average age of 54.67 years. In the intervention group (orthodentol), male constituted 55.6 percent, and they had an average age of 57.80 years. In the control group, the most common causes of hospitalization were laparotomy and multiple traumas with 26.7% and 22.2% patients, respectively. In the intervention group, the most common causes of hospitalization were multiple traumas, Intracranial Hemorrhage (ICH), and Cerebrovascular Accident (CVA) with 22.2% and 15.6%, respectively (Table 1).

The comparison of oral hygiene in both the groups showed that there was no significant difference between them before intervention and at the time of the investigation (first 8 hours) using the duplicate values test. In

Table 1. Comparing descriptive indices in study group with separated study variables

		Chlorhexidine (n = 45) Frequency (%)	Orthodentol (n = 45) Frequency (%)	P
Sex	Female	21 (46.7)	20 (44.4)	0.832
	Male	24 (53.3)	25 (55.6)	
Antibiotics	No	2 (4.4)	5 (11.1)	0.434
	Yes	43 (95.6)	40 (88.9)	
Ceftazidine	No	32 (71.1)	37 (82.2)	0.071
	Yes	13 (28.9)	8 (17.8)	
Vancomycin	No	31 (68.9)	37 (82.2)	0.141
	Yes	14 (31.1)	8 (17.8)	
Meropenem	No	37 (82.2)	38 (84.4)	0.777
	Yes	8 (17.8)	7 (15.6)	
Ciprofloxacin	No	396 (86.7)	40 (88.9)	0.748
	Yes	6 (13.3)	5 (11.1)	
Ceftriaxone (rosphim)	No	31 (68.9)	24 (53.3)	0.130
	Yes	14 (31.1)	21 (46.7)	
Metronidazole	No	38 (84.4)	42 (93.3)	0.180
	Yes	7 (15.6)	3 (6.7)	
Clindamycin	No	41 (91.1)	42 (93.3)	1.000
	Yes	4 (8.9)	3 (6.7)	
Gentamicin	No	44 (97.8)	40 (88.9)	0.203
	Yes	1 (2.2)	5 (11.1)	
Kephelin (Cefazolin)	No	40 (88.9)	41 (91.1)	1.000
	Yes	5 (11.1)	4 (8.9)	
Amikacin	No	43 (95.6)	45 (100)	0.494
	Yes	2 (4.4)	0 (0)	
Acyclovir	No	44 (97.8)	45 (100)	1
	Yes	1 (2.2)	0 (0)	

Table 2. Test results of duplicate values for oral hygiene variables at the time of examination according to the study groups

Variable	Time	Chlorhexidine Mean (SD)	Orthodentol Mean (SD)	Total in Time
Lips	8 48 72	2.16 (64) 2.29 (0.65) 2.42 (0.58)	1.91 (0.56) 2.33 (0.60) 2.24 (0.57)	2.03 (0.61) 2.31 (0.57) 2.33 (0.58)
Total		2.2 (0.06)	2.16 (0.06)	
Gums and oral mucosa	8 48 72	2.20 (0.97) 2.60 (0.78) 2.62 (0.81)	2.07 (0.96) 2.40 (0.89) 2.69 (0.79)	2.13 (0.96) 2.50 (0.84) 2.66 (0.80)
Total		2.47 (0.10)	2.39 (0.10)	
Tongue	8 48 72	2.20 (0.63) 2.29 (0.66) 2.42 (0.75)	2.04 (0.74) 2.51 0.87) 2.49 0.82)	2.12 (0.68) 2.40 (0.78) 2.46 (0.78)
Total		2.35 (0.75)	2.35 (0.09)	
Tooth	8 48 72	2.04 (0.74) 2.00 (0.56) 2.13 (0.46)	1.89 (0.57) 2.02 (0.62) 2.04 (0.56)	0.97 (0.66) 2.01 (0.59) 2.09 (0.51)
Total		2.06 (0.07)	1.99 (0.07)	
Saliva	8 48 72	2.73 (0.50) 2.71 (0.51) 2.80 (0.55)	2.76 (0.53) 2.67 (0.64) 2.84 (0.56)	2.74 (0.51) 2.69 (0..57) 2.82 (0.55)
Total		2.75 (0.06)	2.76 (0.06)	
Total number of oral hygiene	8 48 72	1.33 (2.22) 11.87 (1.94) 12.40 (2.17)	10.67 (2.05) 11.93 (2.62) 12.31 (2.19	11.00 (2.15) 11.90 (2.29) 12.36 (2.17)
Total		11.84 (0.27)	11.64 (0.27)	
Surface of saliva	8 48 72	1.84 (0.76) 2.11 (0.61) 2.36 0.53)	1.60 (0.54) 2.02 (0.40) 2.33 (0.60)	1.73 (0.67) 2.07 (0.52) 21.34 (0.56)
Total	2.11 (0.07)	1.99 (0.07)		
Tooth plaque	8 48 72	1.82 (0.75) 1.87 (0.55) 2.07 (0.39)	1.67 (0.56) 1.93 (0.54) 0.84 (0.56)	1.74 (0.66) 1.90 (0.54) 1.96 (0.50)
Total		1.92 (0.07)	1.82 (0.07)	

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other words, the two groups (intervention and control) were similar in oral hygiene. Comparison of oral hygiene in terms of variables studied among patients in the intervention and control groups showed that there was no significant difference between them over time (48 and 72 hours) using the duplicate values test (Table 2).

3. Discussion

The results showed that there was no significant difference between intervention and control groups in terms of oral hygiene of patients at the beginning of the study (before intervention). In addition, oral hygiene of the patients in the intervention and control groups significantly improved at the end of the study compared to beginning of the study and before intervention. In other words, both mouthwash solutions showed similar effectiveness in improving the oral health of patients hospitalized in ICUs.

The results of this study showed that the oral hygiene of patients hospitalized in ICUs is not desirable during hospitalization. This finding is in line with the results of the study by Monro and Grap who reported that the oral hygiene of patients hospitalized in special care units might already be weak. The results of the current study are also consistent with the report of the Society of Surgeons about oral hygiene in America that revealed oral and dental diseases existed as silent epidemics in the society (Berry 2011).

Comparison of the oral hygiene of patients in the intervention and control groups after the intervention showed that there was no statistically significant difference between the two groups. In other words, the effect of or-

thodentol and chlorhexidine mouthwashes is the same for oral hygiene. In addition, in a study by DerDioso et al. the prevalence of respiratory infections in patients who used chlorhexidine was less than the placebo group. Given that this substance (chlorhexidine) is not absorbed through the skin and mucous membranes and no dangerous side effects have been reported, it is most commonly used in patients with severe disease. Of course, Monro believes that more studies are needed in this regard (Munro & Grap 2004). Despite the advice on the use of chlorhexidine, some studies questioned its effectiveness in preventing Ventilator-Associated Pneumonia (VAP). Though the two mouthwashes (orthodentol and chlorhexidine) improved oral hygiene, there was no difference between the two groups after the intervention.

In a study by Ames on 116 patients hospitalized in ICUs, the effects of a regular oral care program (intervention group) and regular care that is run in accordance with the protocol of each section (for control group) were compared against the Beck Oral Examination and the score for oral mucosal plaque. Their results showed that the mean scores in both groups before and after intervention were the same and that regular care, compared to routine care, has significantly improved oral hygiene. In this study, toothbrush was used for intervention group while the use of toothbrushes in the control group is unclear (Safar Abadi & Ghaznavirad 2012).

Ranjbar et al. conducted a study to investigate the effect of chlorhexidine mouthwash in preventing Superficial VAP and its interaction with the severity of the disease in 80 newly hospitalized patients at Loghman Hospital in Tehran. Their results showed that chlorhexidine mouthwash is more effective on oral hygiene than normal saline (Ranjbar et al. 2010). Nosrat et al. conducted a study in Tehran University of Medical Sciences to examine the impact of effectiveness of Orthodentol mouthwash (carvacrol) on Enterococcus faecalis bacteria as a drug in the canal of the tooth. In their study, it was shown that there is a significant difference between the ability of 6% carvacrol emulsion and calcium hydroxide in the removal of E. faecalis bacteria after 7-day dressing (Nosrat et al. 2009). In a study by Sageat Al-Islam et al. regarding the effects of antibacterial activity of Khouzestani Savory (carvacrol) on oral pathogens, it was found that Khouzestani Savory with a concentration of 0.31 mg/ml carvacrol removes oral pathogens (Seghatoleslami et al. 2009). The results of the current study showed that orthodentol solution (which is a herbal compound) and chlorhexidine (which is a chemical medicine) have a similar effect on oral hygiene of patients hospitalized in ICUs. Considering the benefits of herbal compounds, orthodentolcan be used as alternatives to chlorhexidine.

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Conflict of Interest

The authors declare no conflicts of interest.

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