

# Application of Peppermint Water Spray Combined With Cucumber Slice External Application or Lip Balm and Conventional Dipping in ICU Dry Mouth Patients

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**Abstract Objective:** to analyze the effect of peppermint water spray combined with external application of cucumber slice or lip balm and conventional dipping in patients with dry mouth in intensive care unit (ICU). **Methods:** 120 patients with secondary xerostomia in our hospital from January 2018 to December 2019 were selected as the subjects. According to the different treatment methods, the patients were divided into A group (Peppermint water spray combined with cucumber slices for external application), group B (Peppermint water spray combined with lip gloss smear), group C (cotton swab dipped in normal saline), 40 cases in each group, and the saliva secretion and dry mouth before and after intervention in three groups were compared between the three groups. The degree of self-evaluation score and the evaluation of throat comfort and satisfaction after intervention. **Results:** after the intervention, the self-evaluation scores of salivary secretion and dry mouth degree of patients in group A and B were significantly higher than those before the intervention ( $P < 0.01$ ), the self-evaluation scores of salivary secretion and dry mouth degree of patients in group A were significantly higher than those in group B and C ( $P < 0.01$ ), and the self-evaluation scores of salivary secretion and dry mouth degree of patients in group B were significantly higher than those in group C ( $P < 0.01$ ). After intervention, the total effective rate of improvement of throat comfort in group A was 87.50%, which was significantly higher than 40.00% in group B and 0.00% in group C ( $P < 0.01$ ). The total effective rate of improvement of throat comfort in group B was significantly higher than that in group C ( $P < 0.01$ ). 97.50% of the patients in group A were significantly higher than 72.50% in group B and 2.50% in group C ( $P < 0.01$ ), and the patients in group B were significantly higher than those in group C ( $P < 0.01$ ). **Conclusion:** homemade peppermint water spray combined with external application of cucumber spray can effectively improve the symptoms of dry mouth and throat discomfort in patients with ICU, improve their satisfaction with treatment, and is conducive to the recovery of patients' diseases, which is worthy of clinical promotion and application.

**Key words:** Peppermint water spray; cucumber slices applied externally; lip balm; dipping water; ICU; Xerostomia; effect, dry mouth cell

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Xerostomia (hereinafter referred to as xerostomia) is not uncommon in clinic, especially in the elderly, with a high incidence. Relevant statistical data show that about 30% to 50% of the middle-aged and elderly patients suffer from xerostomia of different degrees<sup>1</sup>. Xerostomia is a kind of oral symptoms caused by a variety of reasons, including fasting during perioperative period, anesthesia and surgical medication, secretory function changes and other factors, resulting in disorders in the balance of oral salivary secretion and consumption, which can be divided into true xerostomia and false xerostomia. The former is caused by the reduction of salivary secretion, patients can manifest as dry mouth, dry lips, foreign body sensation, burning sensation, taste abnormality, etc., while the latter is caused by the change of salivary components, which may lead to the occurrence of symptoms such as oral fungal infection, bad breath, taste change<sup>2,3</sup>. In addition, xerostomia is not an independent disease, often accompanied by dry skin, endocrine disorders, anemia and so on. Relevant studies show that about 70% of cancer patients in the Intensive Care Unit (ICU) have a higher degree of dissatisfaction with thirst and dry mouth<sup>4</sup>. Some scholars have found through research that perioperative fasting caused by dry mouth can seriously affect patients' sleep quality, increase the occurrence of anxiety, depression and other adverse emotions, which is not conducive to the recovery of patients' disease<sup>5</sup>. At present, cotton swab dipped in water is often used to moisten lips to alleviate dry mouth symptoms, but the clinical effect is limited. In order to alleviate the pain caused by xerostomia, our department has given the hospitalized patients mint water spray combined with external application of cucumber slices or lip balm, and achieved good clinical results. The report is as follows.

## DATA AND METHODS

### General information

120 patients with secondary xerostomia in ICU of our hospital from January 2018 to December 2019 were selected as the study subjects, and this study was approved by the hospital ethics committee. Inclusion criteria: 1) all patients were treated in ICU for more than 24 hours; 2) age ( $\geq 18$  years); 3) no history of medication affecting salivary gland function; 4) conscious taste

symptoms, dry mouth score ( $\geq 1$  point); 5) tolerance to mint taste, no allergy and adverse reactions; 6) patients were conscious at admission and informed consent to participate in this study. Exclusion criteria: 1) patients with dry mouth caused by other diseases; 2) patients with unstable vital indicators such as blood pressure and heart rate; 3) patients with oral mucosal diseases; 4) patients with severe liver and kidney dysfunction; 5) patients with systemic diseases, hemodialysis, head and neck tumors; 6) and patients without oral spray or saliva collection. The patients were divided into group A (mint water spray combined with external application of cucumber slices), group B (mint water spray combined with lip balm), and group C (cotton swab dipped in normal saline) according to different treatment methods. There were 40 cases in each group, including 22 males and 18 females in group A, aged from 20 to 74 years, with an average of ( $46.12 \pm 11.42$ ) years. The APACHE score was ( $15.13 \pm 4.62$ ) years old; there were 24 males and 16 females in group B, aged from 18 to 75 years, with an average age of ( $47.49 \pm 11.79$ ) years and an APACHE score of ( $16.27 \pm 4.52$ ) years old; there were 25 males and 15 females in group C, aged from 21 to 73 years, with an average age of ( $46.33 \pm 10.24$ ) years and an APACHE score of ( $15.69 \pm 3.74$ ) years old. The general data of the three groups were comparable by statistical test ( $P > 0.05$ ).

### Methods

Patients in group A were given menthol water spray combined with external application of cucumber slices: dried mint was soaked in a ratio of 1g:100ml, air-dried to 25-35 °C, then filled into a 60ml spray bottle. First try spraying on the back of the operator's hand to empty the air of the pot mouth, make the spray evenly distributed, tilt the patient's head to one side, instruct the patient to open his mouth, lift his tongue, spray on the tongue, ask the patient to close his mouth, spray on the left side of the mucosa, instruct the patient to close his mouth, spray on the right cheek mucosa, press the spray bottle 2-3 times about 1ml. The patient was instructed to swallow the mint water, sprayed every 15 min, and configured mint water was replaced every 4 h. A fresh cucumber was cut into 4-5 cm long and 1-1.5 cm wide slices according to the size of the patient's lips. The slices were applied to the upper and lower lips according

to the shape of the lips, and were replaced every 2-4 H.

Group B patients were given peppermint water spray combined with lip balm external application: peppermint water spray application method was the same as group A, towel hot compress to soften the hard skin of the lips, a little bit gently peel off the hard skin, on the lips of patients with colorless lip balm, before bedtime application effect can be doubled, three times a day in the morning, midnight and late.

Patients in group C were given cotton swabs dipped in warm boiled water (25-35 °C) to wet their lips, dipped once every 15 minutes, and the swabs dipped in water should not be too much to avoid coughing.

### Observation index

(1) Salivary secretion volume before and after intervention in the three groups: cotton pad method was used before and after intervention. The cotton pad was weighed and placed at the opening of salivary gland ducts in the patient's mouth. Wet weight was weighed after 2 minutes. Salivary secretion volume (g) = wet weight-dry weight.

(2) Self-rating score of dry mouth degree: before and after intervention, the patients were given a visual analog digital score table, and were divided into 10 points by drawing a straight line on the paper, and 0 points were marked as no dry mouth. 10 points indicated that dry mouth was the most serious, so that the patients could tell themselves about dry mouth before and after intervention.

(3) Throat comfort: self-made subjective throat comfort grading was used to evaluate the improvement effect of throat swelling, pain and itching in the three groups after intervention. Grade 0 was no throat swelling, pain and itching, grade 1 was mild throat swelling and itching, and grade 2 was severe throat swelling, pain and itching. Effective: after intervention, it changed from grade 2 to grade 1 or grade 1 to grade 0. Ineffective: before intervention, grade 1 and grade 2 did not change after intervention.

(4) Satisfaction evaluation: to compare the satisfaction of the three groups of patients with dry mouth relief after intervention, a self-made satisfaction questionnaire was used, including four parts: very satisfied, satisfied, general and

unsatisfactory. Satisfaction = (very satisfied + satisfied)/total number of cases x 100%.

### Statistical methods

Data in this study were analyzed by SPSS21.0 software package, measurement data were expressed by ( $\bar{x} \pm s$ ). Data between two groups were compared by t-test, and data between multiple groups were compared by ANOVA. All count data were expressed by [n (%)]. Data between two groups were compared by  $\chi^2$  test.  $P < 0.05$  was considered to be statistically significant.

## RESULTS

### Comparison of salivary secretion in three groups before and after intervention

After intervention, the salivary secretion of patients in groups A and B was significantly higher than that before intervention ( $P < 0.01$ ), the salivary secretion of patients in group A after intervention was significantly higher than that in groups B and C ( $P < 0.01$ ), and the salivary secretion of patients in group B after intervention was significantly higher than that in group C, the difference was statistically significant ( $P < 0.01$ ). See Table 1.

Table 1					
Comparison of salivary secretion before and after intervention among the three groups ( $\bar{x} \pm s$ )					
Group	Case	Pre-intervention	Post-intervention	t	P
p	s	n (g)	n (g)		
Group A	40	2.86±1.54	5.68±2.23	6.581	<0.001
Group B	40	3.01±1.47	4.66±1.15	7.063	<0.001
Group C	40	2.98±1.63	3.10±1.58	0.334	0.739
F		0.11	27.15		
P		0.900	<0.001		

### Comparison of self-rating scores of dry mouths before and after intervention in the three groups

After the intervention, the self-assessment scores of dry mouth degree in two groups A and B were significantly higher than those before the intervention ( $P < 0.01$ ), the self-assessment scores of dry mouth degree in group A were significantly higher than those in groups B and C ( $P < 0.01$ ), and the self-assessment scores of dry mouth degree in group B were significantly higher than those in group C after the intervention, the difference was statistically significant ( $P < 0.01$ ). See Table 2

Table 2

Comparison of self-rating scores of dry mouths before and after intervention in three groups ( $\bar{x} \pm s$ )

Group	Cases	Pre-intervention score	Post-intervention score	t	P
Group A	40	7.57±1.45	1.43±0.05	26.765	<0.001
Group B	40	8.02±1.02	3.71±1.05	18.621	<0.001
Group C	40	7.96±1.26	7.16±2.38	1.879	0.064
F		1.51	227.82		
P		0.224	<0.001		

### Comparison of improvement effect of throat comfort among three groups of patients after intervention

The total effective rate of throat comfort improvement after intervention in group A was 87.50%, which was significantly higher than that in group B (40.00%) and group C (0.00%) ( $P < 0.01$ ), and the total effective rate of throat comfort improvement in group B was significantly higher than that in group C ( $P < 0.01$ ). See Table 3

Table 3

Comparison of improvement effect of throat comfort among three groups after intervention [n (%)]

Group	Cases	Effective	Ineffective	Effective rate
Group A	40	35 (87.50)	5 (12.50)	35 (87.50)
Group B	40	16 (40.00)	24 (60.00)	16 (40.00)
Group C	40	0 (0.00)	40 (100.00)	0 (0.00)
$\chi^2$				62.813
P				<0.001

### Comparison of satisfaction among three groups after intervention

The satisfaction rate of group A after intervention was 97.50% significantly higher than that of group B (72.50%) and group C (2.50%) ( $P < 0.01$ ), and the satisfaction rate of group B was significantly higher than that of group C ( $P < 0.01$ ). See Table 4.

Table 4

Comparison of satisfaction among the three groups after intervention [n (%)]

Group	Cases	Very satisfied	Satisfied	General	Dissatisfied	Satisfaction
Group A	40	28 (70.00)	11 (27.50)	1 (2.50)	0 (0.00)	39 (97.50)
Group B	40	15 (37.50)	14 (35.00)	6 (15.00)	5 (12.50)	29 (72.50)

Group	40	0 (0.00)	1 (2.50)	14 (35.00)	25 (62.50)	1 (2.50)
$\chi^2$						79.386
P						<0.001

## DISCUSSION

Xerostomia refers to the dry state or sensation of the mouth caused by reduced salivary secretion. It is caused by a variety of factors. It is a self-conscious symptom, not an independent disease. It perplexes many people for a long time or a short time. It is more common in clinical practice. Generally, when the rate of salivary secretion is less than the sum of the rate of salivary absorption and the rate of salivary evaporation of oral mucosa, dry mouth can be diagnosed as xerostomia as long as the patient complains of dry mouth<sup>6</sup>. Relevant data show that 30% to 50% of middle-aged and elderly people suffer from xerostomia to varying degrees, which has a serious impact on the quality of life of the elderly<sup>7</sup>. Xerostomia can be divided into two categories, including true xerostomia caused by reduced salivary volume and pseudoxerostomia caused by unchanged salivary volume. True xerostomia often involves the decline of salivary gland function. The clinical manifestations include foamy sleep fluid, no salivary pool at the floor of the mouth, tongue dorsum, atrophy of filamentous papilla and other symptoms. Special attention should be paid to whether the patient is taking drugs or taking drugs for a long time, and whether it is accompanied by other systemic diseases<sup>8</sup>. True xerostomia can be diagnosed when the stimulated salivary flow rate is less than 0.5-0.7 ml/min and the static salivary flow rate is less than 0.1 ml/min in clinical diagnosis. In addition, patients with hyposalivary gland function can also present with difficulty in speaking, altered taste, and fear of eating spicy and stimulating food in addition to dry mouth symptoms. Pseudo-xerostomia may be caused by changes in the composition of the sleep fluid. As long as the patient complains of xerostomia, the diagnosis of xerostomia can be confirmed<sup>8</sup>.

The etiology of xerostomia is complex and diverse. The most common etiology is drug-induced xerostomia, followed by radiation xerostomia and Sjogren's syndrome. In addition, anxiety, stress and malnutrition are also associated with the occurrence of xerostomia. 64% of patients with xerostomia are related to drugs. Some foreign

scholars have found that the most common side effect of 100 commonly prescribed drugs is xerostomia<sup>9</sup>. Anticholinergic drugs such as atropine and scopolamine compete with acetylcholine for receptors and inhibit the secretory function of salivary glands, leading to dry mouth. Antidepressants, especially tricyclic antidepressants, have similar effects to atropine and cause dry mouth. Some Chinese herbs and even edible plants such as pepper and garlic can cause dry mouth. Decreased oral salivary flow has been reported to be associated with the treatment of various drugs, which cause more severe xerostomia in women than in men<sup>10</sup>. Relevant investigations have found that 80% of patients receiving radiotherapy will have different degrees of dry mouth. Radiotherapy can cause gland atrophy or even death. With the development of radiotherapy, the damage of acinar cell membrane leads to the interruption of intracellular signaling, leading to the loss of acinar cell function and the change of salivary components. However, in some patients the dry mouth becomes irreversible, the secretory function of the parotid gland is severely impaired, and the secretion of stimulated saliva is difficult to detect<sup>5</sup>. In ICU of our hospital, some elderly patients cannot eat because of illness, and the patients are used to breathing with open mouth, which leads to a large amount of energy consumption and water loss, resulting in dry oral mucosa and a series of complications. At present, the research on xerostomia at home and abroad mostly focuses on xerostomia caused by the use of special drugs, hemodialysis and tumor radiotherapy, etc., and the related research on xerostomia in ICU patients started late with insufficient attention<sup>6</sup>. Saliva lubricates the mouth, softens food, reduces the accumulation of bacteria and food residues, and also helps to dilute acidic products. Saliva can convert starch into maltose in food, and also contains mucin and amylase. Mucin can protect gastric mucosa and increase the anti-corrosive effect of gastric mucosa. The normal salivary pH value is 6.35-6.85, which can inhibit bacterial growth and prevent dental caries<sup>11</sup>. Small amount of saliva secretion can reduce food residues and foreign bodies in the oral cavity, so the self-cleaning effect of the oral cavity is poor, and the caries rate of patients with dry mouth is higher. In addition, xerostomia can also affect the patient's taste,

difficulty in chewing and swallowing food, and affect the function of the whole digestive system. Relevant data show that xerostomia can cause physical and psychological discomfort, reduce physical resistance, and even aggravate patients' agitation when awake, which is not conducive to patients' recovery after surgery<sup>7,12</sup>. In order to alleviate patients' dry mouth symptoms, frequent cotton swabs dipped in water are often used to moisten patients' lips or let patients gargle with cold boiled water, which not only increases the work of nursing staff, but also fails to activate the secretory function of salivary glands during the implementation process, and has no significant effect on improving dry mouth. In addition, it has been reported that vitamin C tablets can alleviate the symptoms of dry mouth after some operations. Although special equipment and personnel are not required to care for this method at the bedside, vitamin C tablets cannot alleviate dry mouth in time, on the other hand, it can also promote small intestinal peristalsis, which is extremely unfavorable for the recovery of patients undergoing gastrointestinal surgery.

Mint is a traditional Chinese medicine. Pharmacological studies have shown that it has the effects of clearing heat, waking up the brain, detoxifying, analgesic and antipruritic. Mint is cool and spicy with functions of clearing the head, evacuating wind and heat, and relieving pharynx. Compared with normal saline, it has bactericidal and bacteriostatic effects in oral care, and can significantly improve yin, Qi and Yin of lung, stomach and kidney organs in patients with xerostomia. It can not only promote the production of saliva in kidney, but also promote the regulation of pulmonary water channel, so that body fluids can reach the oral cavity smoothly, moisturize oral mucosa, and alleviate dry mouth symptoms; In addition, catecholic acid components in mint have a good inhibitory effect on oral inflammation<sup>9</sup>. Mint water spray moisturizes the mouth, sprays small and uniform particles on the lips, mouth, throat, stimulates the secretion of salivary glands, prevents mucosal dryness, and alleviates the symptoms of throat irritation; On the other hand, it can improve the mucosal inflammation injury caused by the long-term lack of body fluid in patients' oral cavity, and can improve the degree of oral hygiene of

patients to varying degrees, and increase the comfort of patients<sup>9</sup>. As an oral care solution, Mint liquid can not only inhibit bacteria, but also make the patient's oral cavity fresh and comfortable, breathe aromatic, local mucosal irritation is small, no adverse reactions and contraindications, easy to be accepted by patients, cheap, easy to use materials. A small amount of spray should be used for many times. If the stimulation is too strong, it can also cause discomfort to the patient. Because ICUs are mostly critically ill patients, in order to avoid the cough caused by drinking water or gargling, some scholars have found that the liquid in the form of spray relieves dry mouth symptoms significantly<sup>10</sup>. The spray bottle can distribute the solution more evenly in the oral cavity, act on the oral mucosa, avoid the congestion of gastrointestinal tract caused by swallowing. In addition, it can also moisturize the throat where the cotton swab cannot wet, and prevent suction asphyxia caused by the falling off of the cotton swab, which is simpler and easier than traditional methods and greatly improves the work efficiency of nursing staff. The use of sprays makes nursing more effective and safer. In addition, the spray bottle can be reused, save materials, avoid waste and environmental protection<sup>5</sup>.

The water content of cucumber is as high as 96%-98%. Traditional Chinese medicine believes that it has a smooth taste and has the functions of clearing away heat and thirst, diuresis and edema. Modern medicine believes that cucumber is rich in protein, sugar, vitamins (B2, C, E), carotene, calcium, phosphorus, iron and other nutrients necessary for human life activities. At the same time, cucumber also contains a variety of free amino acids, fine cellulose, chlorogenic acid and other components. Cucumber contains cucumber acid which promotes metabolism and excretes toxins, and its vitamin content is five times that of watermelon. Cucumber can also inhibit the conversion of carbohydrates into fat, which helps to reduce inflammation; at the same time, it is rich in serum, moisturizing and hydrating, improving local skin resistance and other effects. In addition, cucumber enzymes in cucumber can effectively promote the metabolism of the body. The B vitamins contained in cucumber can improve nervous system function and improve insomnia symptoms of patients. Alanine and arginine contained in Cucumber play a certain role in

clinical adjuvant treatment of liver diseases. External application of cucumber slices can stimulate the secretion of oral glands through conditioning, reduce the colonization and reproduction of pathogenic bacteria in the oral cavity, and prevent stomatitis and throat infection to a certain extent<sup>13</sup>. The oral mucosa has a large surface area, abundant blood flow and good permeability. It can absorb the active ingredients in cucumber, improve thirst symptoms, keep lips moist and reduce the severity of dry lips. In addition, cucumber also has a unique natural fragrance, which makes patients feel comfortable, can effectively prevent cracking, is economical and convenient, and patients and their families are willing to accept. Some scholars have found that external application of cucumber slices to patients who need fasting can significantly improve the condition of patients' lips and improve the comfort of patients eating orally<sup>11</sup>. In conclusion, cucumber slices can significantly reduce dry mouth, keep the mouth fresh, reduce pain, make patients feel cool and full mouth, increase comfort and pleasure. Therefore, cucumber slice therapy can be used for oral care of dry mouth patients in ICU, which is worthy of clinical promotion. However, sleeping patients should be cautious to use it in case of cough, asphyxia and other consequences caused by misaspiration of trachea. The main function of lip balm is to provide a barrier for both lips to lock in water, which is basically composed of honey, protein, vegetable extract oil, petroleum jelly and other substances. It provides a barrier for both lips to lock water to alleviate thirst according to the special needs of the skin<sup>14</sup>. Colourless lip balm is used to avoid the absorption of visible energy by lip balm. It can destroy intracellular DNA, cause cell mutations, and lead to the occurrence of lip cancer. On the other hand, the pigments in lipstick can not only enter the human body through food, but also absorb the pigments in the oral mucosa. These pigments can also cause potential harm to the body, so choose a colorless lip balm.

In this study, mint water spray combined with external application of cucumber slices (group A), mint water spray combined with lip balm (group B), cotton swab dipped in normal saline (group C) were used to intervene dry mouth patients. The results showed that group A was superior to group B and C in terms of salivary volume secretion and

self-rating score of dry mouth after intervention, indicating that the combination of peppermint water spray and external application of cucumber slices could significantly alleviate the symptoms of dry mouth in ICU patients, and the clinical effect was significant. From the improvement of patients' throat comfort and satisfaction, group A > group B > group C, which is to alleviate patients' dry mouth symptoms, but also increase patients' psychological comfort.

In conclusion, homemade peppermint water spray combined with external application of cucumber spray slices can effectively improve the symptoms of dry mouth, throat discomfort and other symptoms of ICU patients, improve patients' satisfaction with treatment, and facilitate the recovery of patients' disease, which is worthy of clinical promotion and use<sup>15</sup>.

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