Research Paper

Study on Effect of Chlorhexidine Gargle Combined with Oral Care on the Improvement of Pain Symptoms in Oral Anaerobe Infection

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To investigate the effect of oral care combined with compound chlorhexidine gargle intervention mode in patients with oral anaerobe infection. A total of 300 patients with oral anaerobe infection who were treated in our hospital from March 2021 to March 2022 were selected and grouped by the random number table method. The control groups received oral care+tinidazole gargle intervention and the observation group received oral care+compound chlorhexidine gargle intervention. The patients were observed for oral pathogenic bacteria clearance, gingival pain relief and clinical effectiveness. After intervention, the clearance rates of oral *Prevotella intermedia, Porphyromonas gingivalis, Fusobacterium nucleatum, Prevotella melaninogenicus, Streptococcus mitis* and *Actinomyces israelii* in the observation group were higher than those in the control group, with significant differences ($p<0.05$); the gingival pain visual analogue scale scores of the observation group after intervention were lower compared with those of the pre-intervention and control groups ($p<0.05$); the overall clinical response rate of condition control in the intervention group was 98.00 %, which was significantly higher compared with 90.67 % in the routine group, with statistically significant difference ($p<0.05$). Patients with oral anaerobe infection can achieve more desirable oral cleaning, bacteriostatic and sterilization effects effectively relieve gingival pain symptoms, by using compound chlorhexidine gargle combined with routine oral care.

Key words: Oral anaerobe infection, oral care, compound chlorhexidine gargle, gingival pain

The clinical symptoms of patients with oral anaerobe infection are mainly characterized by halitosis after getting up, nasal blockage, reduced salivary secretion, dry mouth and so on, but also accompanied by different degrees of discomfort such as gingivitis and pulpitis, the severe patients can have obvious gingival pain and other problems, and can even develop anaerobes sepsis, threatening life safety[1,2]. At present, the medical intervention is mainly used clinically to control the condition of patients with oral anaerobe infection and then relieve the clinical symptoms of patients. At present, the common drugs for clinical antibacterial intervention of oral anaerobe infection mainly include tinidazole, metronidazole, clindamycin, penicillin and so on. It has been reported that while implementing oral care with timely intervention using effective antimicrobials, most patients with oral anaerobe infection can be cured and can achieve good rehabilitation outcomes[3]. This study mainly investigated the efficacy of oral care combined with compound chlorhexidine gargle rinse intervention mode in patients with oral anaerobe infection, and the report is as follows.

MATERIALS AND METHODS

General data:

A total of 300 patients with oral anaerobe infection diagnosed and treated in our hospital in a year were enrolled and the specific time period was from March 2021 to March 2022. The included cases were divided into groups to develop the study using the random number table method and the number of cases in each group was 150.

Patient gender in the control group: 83 males and 67 females; age: 18 y-65 y, mean (34.61±4.28) y; types of oral diseases: 86 cases of pericoronitis, 37 cases of apical periodontitis and 27 cases of periodontitis.

Patient gender in the observation group: 80 males

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and 70 females; age: 19 y-68 y, mean (34.75±5.84) y; types of oral disease; 90 cases of pericoronitis, 35 cases of apical periodontitis and 25 cases of periodontitis. The results of statistical analysis of the basic data related to the included cases showed no significant difference between the groups (p>0.05).

Inclusion criteria and exclusion criteria:

Inclusion criteria: Definite diagnosis of oral infection (periodontitis, apical periodontitis, pericoronitis) by aetiological examination and clinical examination, requiring anaerobe drug intervention; good compliance after admission; voluntary participation under the premise of informed study methods and objectives, and signed informed consent.

Exclusion criteria: Had used anti-anaerobic drugs within 48 h before enrollment; presence of vital organ (kidney, liver, heart, etc.) insufficiency, hematologic diseases, etc.; allergy to relevant drugs applied in the study; with cognitive impairment or psychiatric disorders and medical history.

Methods:

Control group intervention methods: The patients in this group were given routine oral care, while oral cleaning and bactericidal intervention were performed using concentrated tinidazole gargle (Zhejiang HaCon Pharma, Saudi Food Drug Authority (SFDA) Approval No. H20010709). Wipe the patient's mouth with cold and heat stimulation, prepare 3 cups of water that is warm, cold and contains normal saline and caregivers should put gauze in warm water, dip it in normal saline, remove it, wring it and then scrub the patient's mouth. The order of scrubbing was specified as lip, teeth, tongue, buccal mucosa of the mouth as well as the base. Then a new piece of gauze was placed in ice water, removed after moistening in normal saline, wringing and buccal scrubbing was performed in the order described above. The above operation was performed twice/d. The patient was instructed to use warm water to gargle before and after eating and to brush his teeth carefully in the morning and evening of the day. In patients with mild to moderate oral dysfunction, brushing is performed using a child toothbrush dipping with foam free toothpaste. In patients with more severe oral dysfunction, brushing is performed after using a motorized toothbrush with foam free toothpaste. The patient used concentrated tinidazole gargle for oral cleaning and rinsing. Gargling with gargle 10 ml/time, the residence time is about 1 min/time and gargle must not be swallowed.

Intervention methods of observation group: The patients in this group received the same oral care as the control group, while oral cleaning bactericidal intervention was performed using compound chlorhexidine gargle (Jiangsu Zhiyuan Pharmaceutical, SFDA Approval No. H32026694). Add 30-60 ml of compound chlorhexidine gargle stock solution to the oral cleaning irrigator, insert the pipette into the irrigator and swirl the rinsing head connecting cap. The patient's oral hygiene status and the degree of mouth opening were taken as basis to select the appropriate rinsing head. Patients with an open mouth more than I degree choose to use direct rinsing, with the applicator rotating to a single beam or fan-shaped water location for rinsing; in patients with an open mouth I and below, a connecting tube was chosen for rinsing. When performing local targeted rinsing, connect damage free deep rinsing head for rinsing. When the patient takes a standing or sitting position for rinsing, the head needs to be slightly forward leaning while opening the mouth, the applicator is aligned with the corresponding site, then the middle finger is combined with index finger to withhold the press wrench of the rinser several times. During the washing process, the force of the drug fluid impingement will change following the force of the finger pressure and the rinse fluid in the patient's mouth needs to be discharged promptly to prevent choking from occurring. For the patient in the lateral decubitus position for rinsing, a curved dish was used to catch the liquid flowing from the corner of the patient's mouth during flushing to prevent the patient from choking on the flushing operation.

Patients in both groups used drugs for oral cleaning and rinsing 1-2 times/d, when gargling, it must guarantee that the gargle and oral mucosa can sufficiently contact, and the contact time must be more than 2 min. Patients in both groups continuously used corresponding drugs for gargling for 1 w.

Observational indexes:

Assessment of oral anaerobe clearance: The pus was aspirated using syringe for bacterial culture before intervention and after disinfection of the patient's mouth, the identification of bacterial species was performed and the removal of pathogenic bacteria was observed.

Symptom assessment of gingival pain: The degree of gingival pain in the patients was assessed by Visual Analog Scale (VAS)[4] before and after the intervention. Of this scoring method, VAS score=0 points indicates no pain sensation and VAS score=10 points indicates

the worst degree of pain.

Clinical efficacy assessment: The related clinical symptoms were all basically or totally disappeared after treatment, the results of pathogen examination showed that the periodontitis patient's periodontal index was 0, the pathological status all returned to normal, the gingival redness, tenderness, limitation of mouth opening, epiphora and other symptoms of the patients with pericoronitis were completely disappeared, judged as the effective; after the intervention, the related clinical symptoms improved significantly compared with those before the intervention, symptoms of epiphora, halitosi and gum pain all improved significantly, and the related inflammatory response was basically recovered and judged to be better; none of the relevant clinical symptoms improved or further aggravated after the intervention compared with before the intervention, which was judged as ineffective. Total effective rate=efficacy rate+better rate[5].

Statistical methods:

The statistical analysis of data in the study was performed by Statistical Package for Social Sciences (SPSS) 25.0 and $p<0.05$ was taken to indicate significant differences. Count data are presented as percentage (%) and measurement data are presented as standard deviation "$\bar{x}\pm s$", and Chi-square (χ^2) test and t test are used for comparison.

RESULTS AND DISCUSSION

Pathogenic bacteria pathogens detected were mainly *Porphyromonas gingivalis, Prevotella intermedia* and *Prevotella melaninogenicus*, etc., the clearance rates of related pathogens in the observation group were all significantly higher compared with the control group after intervention ($p<0.05$), as shown in Table 1.

No significant differences in VAS scores were found between the two groups before receiving the intervention as assessed by gingival pain ($p>0.05$). After the intervention was implemented, VAS scores of patients in both groups were significantly lower compared with those before the intervention, and the scores after the intervention in the observation group were significantly lower than those in the control group ($p<0.05$), as shown in Table 2.

Patients in both groups achieved high clinical effectiveness after the intervention, but patients in the observation group had significantly higher clinical effectiveness rates compared to the control group ($p<0.05$), as shown in Table 3.

TABLE 1: COMPARISON OF THE EFFECT OF CLEARANCE OF PATHOGENIC BACTERIA BETWEEN THE TWO GROUPS (CASES)

Pathogenic bacteria		Control group	Observation group	χ^2	p
Prevotella intermedia detection	Before intervention	102	105		
	After intervention	102	12	3.88	0.05
	Clearance rate	0.78	0.89		
Porphyromonas gingivalis detection	Before intervention	166	168		
	After intervention	20	9	4.72	0.03
	Clearance rate	0.88	0.95		
Fusobacterium nucleatum detection	Before intervention	105	111		
	After intervention	27	12	8.1	0
	Clearance rate	0.743	0.892		
Prevotella melaninogenicus detection	Before intervention	105	102		
	After intervention	31	15	6.57	0.01
	Clearance rate	0.705	0.853		
Oral *Streptococcus mitis* detection	Before intervention	93	99		
	After intervention	15	7	3.88	0.02
	Clearance rate	0.839	0.929		
Actinomyces israelii detection	Before intervention	45	50		
	After intervention	21	5	4.48	0.03
	Clearance rate	0.733	0.9		

TABLE 2: COMPARISON OF VAS SCORES BETWEEN THE TWO GROUPS (POINTS, ($\bar{x}$±s))

Group	n	Before intervention	After intervention	t	p
Control group	150	6.83±1.52	4.07±1.17	7.625	<0.001
Observation group	150	6.86±1.73	3.39±1.10	12.93	<0.001
T	-	0.16	5.186	-	-
p	-	0.873	<0.001	-	-

TABLE 3: COMPARISON OF EFFECTIVENESS OF CLINICAL INTERVENTIONS BETWEEN TWO GROUPS [CASES (%)]

Group	n	Effective	Better	Ineffective	Total effective rate
Control group	150	105 (70.00)	31 (20.67)	14 (9.33)	0.9067
Observation group	150	119 (79.33)	28 (18.67)	3 (2.00)	0.98
χ^2	-				7.545
p	-				0.006

Pericoronitis, periodontitis, apical periodontitis, etc., are common oral infection diseases in the clinical diagnosis and treatment of stomatology, anaerobic infection is the main cause of this type of disease. It has been reported that the prevalence of anaerobes in patients with oral infection diseases can be as high as 96.67 % to 100 %[6]. Early diagnosis of the condition and prompt intervention with targeted and effective measures are extremely important for patients with oral anaerobe infection to improve clinical effectiveness and prevent periodontal endodontic joint lesion, and so on[7]. Tinidazole, metronidazole and ornidazole are all commonly used anti-anaerobic drugs in current disease control interventions for patients with oral anaerobe infection and the anti-anaerobic effect is relatively good[8]. Previous studies showed that routine nursing with tinidazole intervention could achieve good oral cleaning effect, but infection prevention, pain relief and other effects still need to be further improved[9].

Compound chlorhexidine gargle is a class of antibacterial agents commonly used in clinic. The drug is a compound preparation, metronidazole and chlorine gluconate have been defined as its main ingredients, chlorine gluconate has been defined as a spectral fungicide and metronidazole exerts good anti-anaerobic effects[10]. Compound chlorhexidine gargle, as a disinfection and bacteriostatic drug, has been widely used in oral care at present, showed good results in pericoronitis, gingivitis, oral mucositis and other oral care of patients, can improve patient's periodontal abscess, gingival bleeding, gingival pain, oral mucosal ulceration and other symptoms significantly[11]. As per the literature of Tao *et al.*[12], the use of compound chlorhexidine gargle in oral care can not only clean the oral cavity, but also effectively prevent halitosis, exert obvious anti-inflammatory and analgesic effects. In this study, after the oral cleaning intervention with compound chlorhexidine gargle in the oral care of patients in the observation group, the clearance rates of oral infection related pathogenic bacteria in this group were all significantly higher than those in the control group, at the same time, the gingival VAS score of the patients after the intervention was significantly lower, and this score was significantly lower than that of the control group, and there was a statistical significance in the comparison between the groups. The results of this study indicate that patients with oral anaerobe infection who received oral cleaning with compound chlorhexidine gargle based on routine oral care can achieve more desirable bacteriostatic effect and effectively prevent the occurrence of oral infection, while at the same time can reduce the degree of gingival pain in patients effectively. Patients with oral anaerobe infection have a lot of bacteria, which can easily trigger halitosis, infection, gingival pain, and swellings and so on. Compound chlorhexidine gargle showed good killing of both gram positive and negative bacteria. Chlorhexidine has a diffuse effect, and the drug effect is gradually released, which continuously exerts bacteriostatic and bactericidal effects[13,14]. Metronidazole will be reduced into cytotoxic substances when it is in an anaerobic environment and bacterial Deoxyribonucleic Acid (DNA) metabolism can be affected, which in turn exerts the killing and inhibition of *Peptococcus, Streptococcus mitis* and some *Eubacterium* species, reduces the number of oral pathogenic bacteria, controls infection from further aggravated and improves symptoms of gingival pain and swelling in patients. Xiangjuan *et al.*[15] documented that the compound chlorhexidine gargle should not only

enable patients to maintain good oral cleanliness, but also effectively inhibit and prevent the occurrence of oral ulcers, gingival pain and swelling, and improve the effectiveness of clinical treatment of oral infection. In this study, the effectiveness rate of clinical intervention for patients in the observation group was as high as 98.00 % and the difference was statistically significant compared with 90.67 % in the control group. It is known that oral cleaning of patients with oral anaerobe infection based on routine oral care with compound chlorhexidine gargle can improve the clinical control effect of the condition in patients with this disease. Oral cleaning with compound chlorhexidine gargle is accomplished by a dedicated oral cleaning irrigator by a dedicated person and the cleaning operations are timesaving and labor-saving without cross infection, contributing to the improvement of the quality of oral care. It should be noted that the oral cleaning effect of chlorhexidine was closely related to the gargling maintenance time, number and rinsing strength, and the patients could use the drug for gargling after brushing to make the drug efficacy better, and the drug should stay in the oral cavity for not less than 2 min when gargling. After gargling, the patient should not immediately rinse with clear water, eat or drink to avoid reducing the drug concentration in the mouth and affecting drug efficacy. The drug belongs to the topical preparation, must not be swallowed and the drug should be used continuously for not more than 3 courses (5-10 d/1 course). This drug is irritant and shall not contact with eyes.

In conclusion, simultaneous routine oral care and oral cleaning using compound chlorhexidine gargle in the care of patients with oral anaerobe infection can achieve more desirable nursing effect, reduce the degree of gingival pain of patients and improve clinical effectiveness.

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Conflict of interests:

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